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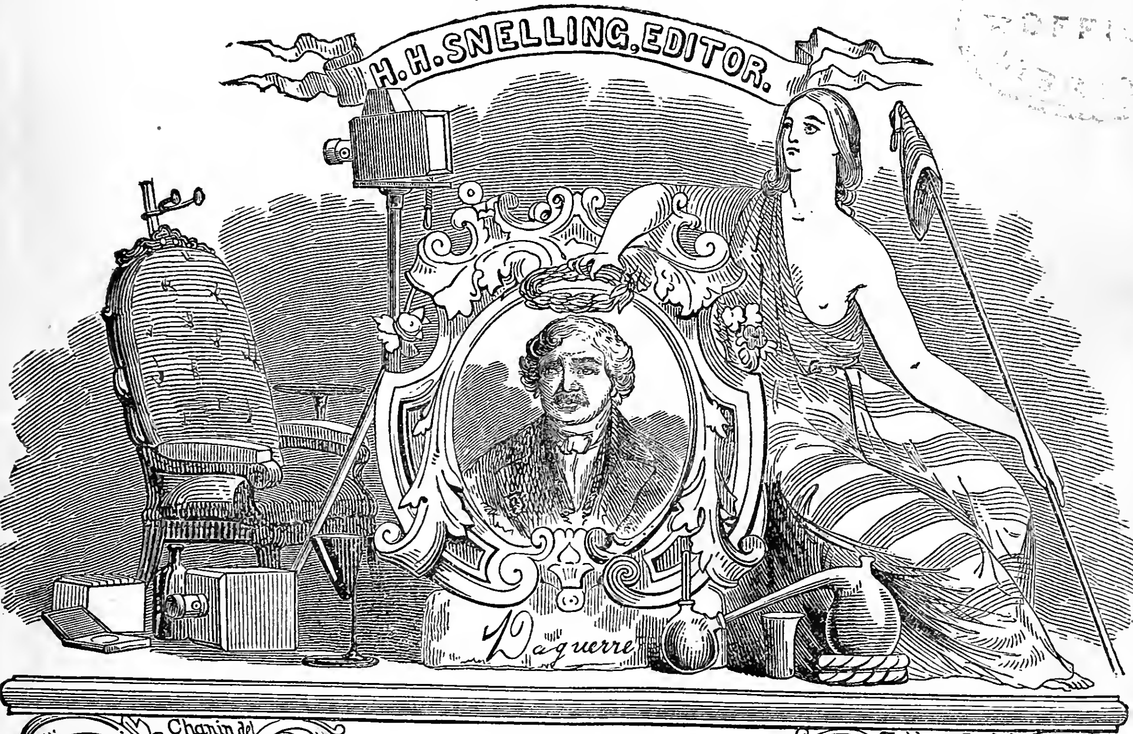

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PHOTOGRAPHIC ART-JOURNAL.

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THE ART OF PHOTOGRAPHY.

Experience has taught the world that secresy is the great bar to all earthly well-being, and if it has not grown wiser by a knowledge of the fact in its domestic relations, it certainly has in business matters; and for this reason it is we see over the whole inhabitable globe, where man has been enlightened by the power of the press, each commercial, mechanical, agricultural, or political class, supporting its own printed organ of intercommunion, for their own special benefit. That each derives great advantages—far, very far beyond the amount invested—from these publications, is a fact now totally beyond dispute. Ask the merchant who first caviled at the publication of Hunt's Merchants' Magazine, and he will tell you, no consideration would induce him to part with it. Ask the mechanic who once thought and declared that for his business, a paper was worse than useless, to relinquish the Scientific American, or any other periodical devoted to his trade, and he would laugh at you—and last but not least, look at that stubborn old farmer, who once scorned to introduce what he ironically was pleased to call book learning, in his practice of Agriculture, poring over the columns of the Cultivator —do you think he will deny its usefulness? Ask him, and he will point to his fields and say to you, there where I once got only twenty bushels of wheat to the acre by my old method, this paper has taught me to get forty—there is land that five years ago yielded me naught but stalks and stones, now produces me two hundred bushels of potatoes. And such you will find to be the experience of all—in every branch of business—who have devoted their leisure hours to the perusal of congenial prints.

And why should not the Daguerreotypist be equally benefitted by a periodical devoted to his interests, particularly when his art is so susceptible of improvement? We can see no reason to doubt it; and it is in consideration of this—admiring and loving the art as we do—that we are induced to undertake the pleasing task of communing monthly with the Daguerrian world, and it shall not be our fault if they fail to derive pleasure and profit from the intercourse.

Our intentions are before the public in our prospectus, and we shall content ourselves by looking a little ahead and predict what we conceive and trust may be the fruits of our labor. We do it not egotistically, for we rely more upon the good sense and ardent desire of Daguerreotypists for their accomplishment than we do on our efforts, whatever they may be.

Even as the art of engraving and sculpture has improved under the criticisms of the press, so must that of Photography.—At the present day it is viewed, too much, in the light of a mere mechanical occupation to arrive at any high degree of excellence. In too many instances men enter into it because they can get nothing else to do; without the least appreciation of its merits as an art of exquisite refinement, without the taste to guide them, and without the love and ambition to study more than its practical application, neglecting the sciences intimately connected with it, and leaving entirely out of the question those of drawing, painting, and sculpture, sister arts, a knowledge of which must tend to elevate the taste and direct the operator into the more classical and elegant walks of his profession.

Daguerreotyping is comparatively rude to what it will be a few years hence. The

pictures now produced stand in relation to those that willbe executed within a quarter of a century, very little better than the ancient Egyptian paintings compared with the beautiful works of the present day, or the early copper engravings of Germany with the exquisite steel productions of our own times. We look forward to a period not far distant, when our best Daguerreotypists will wonder how they could, for so long a time, be content with the specimens of their art they now put forth, as much as they do at this day at the shadows of six and eight years ago.

But a far different feeling must exist among them than that entertained to be productive of the result we predict. In all our intercourse with Daguerreotypists we have found but two who are enthusiastic lovers of the art; and the greatest ambition we detect is a desire to produce a *good* picture so far as the present process will permit—very few, if any, experiments are made to improve the whole system. We have never yet seen a perfect picture, and the fault lies with all the various manipulations in a more or less degree. These are to be corrected only by the most careful and intense study, more than the art has ever yet received from an American operator. We think one fact will illustrate the correctness of our assertion. We know of one of our *best* artists who frequently gets into difficulty from the imperfect working of his material and is quite incapable of discovering the cause, and yet he professes to despise what he calls—and what is partially—the theory of the art; quite ignorant, probably, of the fact that it is to *theoretical* analysis and deduction he is indebted for his art. Had Daguerre and Niepce been ignorant of the sciences of Chemistry and Philosophy, they never would have discovered photography; and as yet none can assert that the latter is perfect, it must be conceded that a more intimate investigation of chemistry and philosophy in connection with photography will lead to new discoveries of the most surprising results.

The philosophers of Europe are daily toiling in search of the still hidden principles of the art, and every year brings forth from their laboratories some new application. But why should we wait for new developments to be wafted to us across the Atlantic, when we have from our extensive practical knowledge of the business so many advantages for noticing its various phases, developing and applying them, and successfully experimenting.

Since the time of Professors Morse and Draper's experiments, what new discoveries—apart from various "Quick stuffs"—have been made by our ten thousand Daguerreotypists? None; at least none have come to light. If any have been made, we must deprecate the selfishness which induces the miserly hoarding of such discoveries It is a great mistake to suppose that individual benefit can result from such a course; it is only by free communication and interchange that permanent advantage can be derived from them. Many may be drawn to an operator's room by the announcement of a new discovery, but many more will think and judge for themselves, and consider it a mere catch-penny affair, unless they are assured of its adoption by others. Thus we have heard numbers reason, and in this age of so much deception it is quite plausible.

Photography must assume a higher sphere and maintain it. It is a noble science, and as such it must be regarded and preserved. If personal considerations do not now make men sensible of this, they soon will exist, for we feel assured, from the eagerness with which our "History and practice of the art of Photography" has been sought after within the last few months, that the minds of Daguerreotypists are awakening to the importance of knowing something more than the mere mechanical portion of their art.

Occasionally I have found men opposed to the publication of works on the art; giving as their reason, that everybody would know as much about it as themselves. The narrow-mindedness and selfishness of this reason is too apparent to merit any thing but contempt. Such men must fall by their own ignorance, and the sooner the profession is relieved of them the better.

That we are not singular in the views above expressed, may be seen from the following extract from a letter received from one of our best artists.

"Dear Sir—Your note, together with circular of the Photograpic Art-Journal, is duly received; and I hasten to reply that I am truly gratified that you have taken so

important a step in the diffusion of knowledge in practical Photography. I hope and really believe that the best of success will attend your noble effort. Long has the art of Photoprapby grovelled in darkness—long has it been enshrouded in mystery, and long has it been practised with very ill success—not because it is of trifling importance, or should rank beneath any one of the fine arts, for the world has christened it king over all; but because its devotees, especially those who have led the craft, have been so self-conceited that they have refused a reunion of thought and action; consequently but little, comparatively, has been done for the perfection of the art. One man may possess great selfishness, but he has not all the knowledge of Photographic manipulation and cannot attain that high state of perfection in thus relying wholly on his own ability, that might be attained by the united efforts of twenty, each, perhaps, as well informed as himself, and I deprecate all those whose constant efforts have been to enshroud the art in mystery. In regard to your requesting me to correspond with the Journal I have only to say that perhaps there are others better qualified than myself; however, I am at the service of the cause—I have dedicated my life to the art and will use my exertions whenever I can be in any way useful. Yours, &c."

Such is the language of an artist. He speaks feelingly and truthfully, although severely, and we cherish the hope that among the chaff we shall find in the course of our editorial career many more kernels like him.

RESEARCHES ON LIGHT;

An examination of all the Phenomena connected with the chemical and molecular changes produced by the influence of the solar rays; embracing all the known Photographic processes, and new discoveries in the art.

BY ROBERT HUNT,

Secretary to the Royal Cornwall Polytechnic Society.

INTRODUCTORY CHAPTER.

Progress of the Inquiry until the announcement of the discoveries of M. Daguerre and Mr. Henry Fox Talbot.

INVOLVED in mystery as every thing is which is connected with the early history of our planet, I should be entangling my subject with useless and abortive speculations, did I venture to offer any on those passages of the Mosiac history which narrate the creation of Light, and of the orbs of the firmament. We there find Light the creation of the first day; and the Sun, which we are accustomed to regard as the source from which light emanates, or the exciting mover of the luminiferous ether, as the creation of the fourth period. Regarding this, our only record of the beginning, as the true expression of the sequence of events, it does not appear to me that we are required to interpret this revealed word to our finite apprehensions. The origin of things is lost in the sepulchural darkness of the antedeluvian ages, into which the eye of the most gifted cannot penetrate. The Pentateuch declares in sublime conciseness, *And God said, Let there be light, and there was Light;* which most distinguishingly marks the importance of this element in the great system of Nature. The grass, the herb yielding seed, and the fruit-tree yielding fruit, owe their growth, their glowing colors, and their serene beauty, to the influences of light. The moving creatures of the waters—the fowl that fly above the earth in the open firmament of heaven—the cattle—the creeping thing and the beast, are all of them directly dependant for healthful vigor, and almost for the con-

tinuance of life, on this mighty creation, which appears to have given form to the chaotic earth, as it chased the darkness from the face of the deep.

An agent influencing every form of animate and inanimate creation, would necessarily excite the attention of the earliest races. As it is by the agency of light, operating through the wonderful mechanism of the organ of vision, that a most extensive and important class of impressions are made upon the mind of man, he has, from the infancy of his days, regarded its source with feelings of wonder; and the Sun has been the object of his untutored adoration.

The uncultivated inhabitant of the wilds of nature has his moments of contemplation; and then his thoughts, travelling in the misty labyrinth of his ignorance and superstition, shadow out a great primary cause, to which he refers all the mysteries of that mighty universe of which he finds himself a proud inhabitant.

The nomadic tribes of the Caucassian valleys, clothed with a luxuriant vegetation, and teeming with life, could but observe the peculiar obedience of organized creation to the influences of the changing seasons. The pastoral state, was one peculiarly adapted to the nourishment of those powers of the mind, which elevate the individual or the mass; and in the shepherd-kings we may see the dawning brightness of the reign of reason, which in a later day gave to a small nation the sovereignty of the known world. Men in this condition could not long remain ignorant of the dependance of all the phenomena of vegetation upon Light. The growth of the plant, the unfolding of the leaf, the formation of the flower, of the fruit and of the seed, were soon found to be under the influence of the orb of day. In spring and summer, nature was seen to grow into strength and beauty, and in autumn and winter it was seen to decline and indeed to die. Some connection between these phenomena, and the increasing and declining powers of the sun, must at an early period have been evident to man; and when the innate consciousness of a creative power was struggling, like the lustrous moon amidst the clouds of midnight, in their simplicity they gave to that orb the attributes of a god. The earliest religions of the Oriental races all bear evidence of this; and the mythology of the Greeks, rich with the poetry of Nature, places one deity at the head of their polytheistic system—the God of Heaven and of Light. In Baal and Astarte—in Zeus and Hera—in Apollo and Athena—we see alike, impersonations of Light the eternal renovator, and of Nature flourishing and decaying.

In those early days all the evident truths were viewed through a veil, which no one dared to draw aside, or dreamed of lifting up. A beautiful poetry overspread creation, and the spirit of life was seen and worshipped in the highest and the lowliest things.

At length a philosophic spirit grew in the mind of man, and young Science presumed to lift his daring hand. His early efforts were, however, "like the gropings of the blind Cyclops in his cavern;" and when searching for truth he too frequently wandered from it.

It does not appear that the phenomena of Light ever received much attention from the ancient philosophers. In their first attempts even to explain vision, they gave to the eye the power of projecting material rays, by which the forms and visible qualities of bodies were *felt out*; but they were at length induced to abandon this absurdity, and adopt the idea of Light as a peculiar medium, through which impressions were made on the eye, but in what manner was left quite undetermined. The heating power of the sun's rays could not escape notice; and the story of the mirrors of Archimedes sufficiently prove that some attention had been paid to this property.

The task developing the progress of the beautiful science of Optics, is not the one to which I have to devote my attention, but to that very extraordinary property of the solar beam, by which chemical changes of the most singular kind are brought about, in living and in dead matter, in organic and inorganic bodies.

Although the most ordinary observer must through all time, have noticed that the sun's rays weakened and destroyed colors, yet this fact excited no attention; and it was reserved for the philosophers of our own time to show that the attentive study of this peculiar property of Light, tends not merely to improve our perceptions of

the beautiful, but leads to the discovery of some of the most important truths connected with the philosophy of the senses, and the secret operations of animal and of vegetable life.

At an early period the beauty of crystalline gems attracted attention; and the great demand there was for them, for the purpose of adorning the person, made the search after them a very lucrative employment. As many of these precious stones possess the property of shining in the dark and of glowing with extraordinary brilliancy in certain positions, it became a matter of conjecture, if they shone with their own light, or if it was, that they again poured out light which they had the power of absorbing. Several Italian and other writers on this subject, particularly Boetius de Boot, say, "No man ever durst aver he had actually seen that stone that of itself afforded light."

That eccentric and extraordinary genius Benvenuto Cellini, however, affirms, in his Treatise on Jewelry, that he has seen the *carbuncle glowing like a coal with its own light.* The only advantage gained by this discussion was, that it led some to endeavor to prepare substances, which should possess the property of emitting light in the dark; and curiosity was at length gratified by the discovery of the *Phosphorus hermeticus*, of *Balduinus*, and of the *Bolonian Stone*, of which the peculiar properties will be mentioned under the proper head.

Amidst all the error and charlatanry of the alchymists, we find many important observations and really great discoveries. Amongst these empirical philosophers were men gifted with minds of a superior order, and the exceedingly careful experiments made by them, whilst they were endeavoring to torture the base metals into gold, and to distil the Elixir Vitæ, became the guiding lights to modern science. In 1556 it was noticed that horn silver was blackened by the sun's rays; and other peculiar influences which the alchymists observed, led them to fancy that the subtile element Light, was one of the most important agents in giving to Nature her infinite variety of form. Possessed with the idea, borrowed from the ancients, that all matter was compounded of three or four simple elements, many of these industrious experimentalists regarded light as the great primary cause, which modified their salt, sulphur, and mercury, and transmuted them into the precious metals, or the myriad forms of organic matter. A notion, indeed, somewhat similar to this prevailed amongst the ancient philosophers, for Democritus speaks of minute atoms in swift motion, which, by their smallness and rapidity, were able to permeate the hardest bodies. "The sun's rays," says Homberg, "will insinuate themselves into bodies so as greatly to increase their weight;" and he seriously relates that four ounces of Regulus Martis, in powder, were augmented by one tenth in the balance, by being exposed for an hour at the distance of a foot and a half from the focus of the Duke of Orleans's burning-glass, notwithstanding much of it was dissipated in smoke: the absorption of oxygen was, of course, unknown to the ingenious Homberg. It will be interesting to review a few more of his assertions connected with this part of the subject. "A perfect metal," he says, "is nothing but very pure mercury, whose small particles are every way pierced and filled with sulphureous principle, or the matter of Light, which links and binds the whole mass together." "Gold," Homberg also says, "differs from silver in nothing but in having the globules of the mercury, whereof it consists, penetrated through and through, and being more fully saturated with the sulphureous principle, or the rays of Light." "The Light of the sun," he continues, "impringing against terrestrial bodies, modifies them according to their several textures; the luminous matter insinuates itself into the substance of bodies, to produce their sulphur, changes the arrangement of their parts; increases them, and consequently alters the substance of the body itself, after as many different manners as in different quantities it can be differently placed. So that, would we compare the variety of the materials which exist with those which might be brought into being, by all the combinations possible to be made, we must say that the universe, so far as we know of it, is but very small in comparison of what it might be; and that if there were several worlds, formed like this of ours, they might all be differently furnished with objects, without changing either the manner or the matter of the bodies whereof they

should consist; which demonstrates an infinite contrivance and power in the Being who made the universe."

The same idea was entertained by the illustrious Newton; but he lends to the speculation all that refinement which distinguishes his philosophical investigations. Sir Isaac Newton demands whether "gross bodies and Light are not convertible into one another; and may not bodies receive much of their activity from the particles of Light which enter into their composition? For all fixed bodies, being heated, emit Light so long as they remain sufficiently heated; and Light mutually stops in bodies as often as its rays strike upon their parts."

The errors which pervaded the chemical philosophy of this period, are too evident to the modern reader, to require any comment, beyond the simple remark in explanation, that the sulphur, salt, and mercury, mentioned by Homberg, are not the gross bodies to which these names are now applied, but certain subtile agents, supposed to be possessed of acid, alkaline, and metallic properties.

The hypothesis of Homberg, and the question of Newton, both exhibit striking proofs of remarkable penetration, and give evidence of minds which were struggling to burst through the materialities which a wretched empiricism had crowded around the philosophy of their times. They perceived agencies at work in the great laboratory of Nature, which could not be brought under the cognizance of the senses; and in the mighty struggle of their gigantic minds, a light, as it were of inspiration, appears to have been granted them. The hypothesis of the early chemist has become truth to one of the most eminent modern physicists: and let us restrain the railroad speed of the science of our day, gliding as it does too commonly over the easiest paths, and viewing in its rapid transit the surface merely, by the reflection that the question asked by Newton remains still unanswered.

A widely diffused and most ably supported theory is at variance with these doctrines; but until theory is indisputably established, we must not allow it to be forced upon us for fact.

I cannot quit this part of my subject without referring to some of the speculations of the talented, though credulous, Boyle. I do this, not with any idea of supporting his views, which I regard as visionary to a certain extent, but for the purpose of showing, that long before inductive science had proved the chemical agencies of the different rays of the prismatic spectrum, the curiosity of gifted minds had led them very nearly to the truth. In the "Memoirs for a General History of the Air," we find the following very remarkable passages, which, although to a certain extent an apology for astrology, are full of suggestions; and, to use Boyle's own words, "wholly to neglect the physical use of the motion of these bodies, (the planets), because superstition has crept in, is very extravagant, and ought not to pass uncensured in men of learning;"—

"Thus every planet," says the Honorable Robert Boyle, "has its own proper Light distinct from that of the others, which is either a bare-quality, and then its utmost use and design is only to illuminate, or else all Light is attended with some peculiar power, virtue, or tincture; whence 'tis plain that every Light has its peculiar property, tincture, and color—its own specific virtue and power, wherein the planets differ from each other; and consequently the celestial bodies are not to be considered as sluggish and unorganised matter, but as full of their proper motion, operation, and life. Thus the sun not only shines upon all the planets, but by his genial warmth calls forth, excites, and raises the motions, properties, and powers peculiar to them: whence, according to the angle they make with that grand luminary, and the degree wherein they are enlightened, either by its direct or oblique rays, in a near or remote situation in respect of the earth, must be more or less perceived by us. As for the manner wherein the planets transmit their powers, and thereby affect the remote bodies, 'tis not difficult to apprehend it; for we affirm no virtue or power to flow from the planets that comes not along with the Light as a property thereof.

* * * * * *

"As the other planets, so also our earth, is not only enlightened, warmed, cherished, and made fruitful by the power, virtue, and influence of the sun, but it hath, moreover, its proper, magnetical, planetary force awakened, fermented, excited, and agitat-

ed, which it sends back with the reflected Light of that Luminary."

I also find in the same Memoir some notices of the Oriental tradition, that the rays of the moon exert a baneful influence upon persons exposed to them. That timber trees, and many plants are materially influenced by the Light of the moon, appears from a very early period, to have been a generally received notion.

Notwithstanding these remarkable agencies, which were supposed to be dependant upon some peculiar principle of Light itself, it does not appear that any experimental evidence of value was gained up to this period. It is clear that the early experimentalists above named, knew not how to distinguish the operations of the Light, Heat, and Electricity from each other; nor indeed did they separate these from the simple phenomena of chemical attraction. They accumulated a large amount of curious facts,—effects depending on very diversified causes, all of which were attributed to that *element* which the author was inclined to regard as the most important and active in his scheme of creation, and the progression of life, to the rejection of any other power.

A more extensive record of observations now opens before us. In 1722 Petit showed that solutions of saltpetre (nitrate of potash) and sal amoniac (muriate of ammonia) crystallised more readily in the Light than they did in darkness. Charles William Scheele of Stralsund, in Swedish Pomerania, one of the most brilliant geniuses of his, or of any age, was the first who analysed the action, and studied the influences, of the differently-colored rays of Light. He discovered that the chloride of silver spread on paper was speedily darkened in the blue rays, whilst the red rays produced but very little or no change.—Senebier, who repeated the experiments of Scheele, states that he found the violet ray to darken the chloride of silver in fifteen minutes, while the red rays required twenty minutes, and the other colors various intermediate periods.

Dr. Priestly was the first to call attention to the fact, that, under the influence of Light, plants emitted considerable quantities of oxygen gas, and absorbed carbonic acid: thus pointing out one of the most remarkable instances, of the beautiful order which is observed in all the works of Nature. Priestley's experiments were confirmed by those subsequently made by Percival, Henry, Ingenhousz, Senebier, and Saussure. Many of the experiments of these philosophers were not so strictly accurate as might have been desired; but the researches of those who have followed them in this path of inquiry, have all tended to confirm most of their results. A future chapter will be devoted to a survey of the very interesting phenomena connected with the respiration of plânts, and the influence of the solar rays upon them during the various stages of their growth.

It became about this time, the latter part of the eighteenth century, a question, whether the observed chemical changes were produced by the Light, properly so called, of the solar rays, or by the heat which accompanied it.

Count Rumford, in a Memoir "*On the Propagation of Heat in Fluids,*" published in the Philosophical Transactions, states, that he saw reason to doubt the existence of those chemical properties in Light which had been attributed to it; and, to conclude, that all those visible changes produced in bodies by the action of the sun's rays, were effected merely by the *heat* which is generated or excited by the Light which is absorbed by them. In 1798 this distinguished philosopher communicated to the Royal Society a Paper, entitled, "*An Inquiry concerning the Chemical Properties that have been attributed to Light.*" The experimental investigations recorded in this memoir are important, and particularly interesting, as marking the progress of the inquiry.

Count Rumford found that gold or silver might be melted by the heat — invisible to sight — which exists in the air at the distance of more than an inch above the point of the flame of a wax candle. He then proceeded to examine what would be the effect of this heat on the oxides of these metals. Having wetted a piece of taffeta riband with a saturated solution of the chloride of gold, it was held, stretched horizontally, over the clear bright flame of a wax candle, the under side of the riband being kept at the distance of about an inch and a half above the point of the flame: that part of the riband which was directly over the point of the flame began almost

immediately to emit steam in dense clouds; and, in about ten seconds, a circular spot, about three quarters of an inch in diameter, having become nearly dry, a spot of a very fine purple color, approaching to crimson, suddenly made its appearance in the middle of it, and, spreading rapidly on all sides, became, in one or two seconds more, nearly an inch in diameter. The hue was not uniform, but varied from a light crimson to a very deep purple, approaching to a reddish brown. No traces of revived gold could be discovered, but the riband had all the appearance of being covered with a thin coating of the most beautiful purple enamel, which, in the sun, had a degree of brilliancy that was sometimes quite dazzling.

Whatever material was saturated with the solution of gold, the same stain was produced by the agency of a strong heat; and it was found that solutions of silver, under similar circumstances, imparted stains of a deep orange color. It was ascertained by several trials that the *light* of the candle produced no change, the decomposition of the salts of gold and silver in these experiments being solely effected by the agency of *heat*.

Count Rumford next proceeded to examine what influence was exerted by the direct solar rays. Pieces of riband were wetted, and parcels of magnesia moistened, with a solution of gold: those which were exposed to the strong Light of the sun gradually changed color, and in a few hours acquired a fine purple hue, whilst those preserved in darkness remained unchanged. It was also found, that the decomposition was more readily brought about, when the riband or the magnesia were exposed in a damp state, than if the solution was permitted to dry on them previous to exposure

Arguing from the facility with which most of the metallic oxides are reduced, by means of charcoal when exposed to a high temperature, that gold might be revived from its solutions in the same manner, if the solution and the charcoal were equally exposed to a sufficient degree of heat, Count Rumford instituted some experiments to put this idea to the test. He found, by putting small pieces of charcoal into a glass tube filled with solutions of gold or of silver, and exposing it to a temperature of 210° Fahrenheit for two hours in the dark, that revived gold adhered to the surface of the charcoal. Similar tubes filled with solution of gold or of silver and fragments of charcoal were exposed to the direct rays of a very bright sun, and in less than half an hour small specks of revived gold, in all its metallic splendor, appeared on the surface of the charcoal. Etherial solutions of gold were found to be decomposed by the solar rays, and even by prolonged exposure to diffused Light. Spirits of turpentine and olive oil were mixed with aqueous solutions of gold and silver, and exposed to heat in a steam apparatus: both of them assisted in reviving the metals, but spirits of wine had no such influence, notwithstanding the presence of carbon, which enters nearly as largely into its composition as it does into the composition of the other two.

From these results Count Rumford concludes, that heat is generated by the absorption of the sun's rays; that at the moment of its generation it exists in almost infinitely small spaces; and consequently it is only in bodies that are inconceivably small that it can produce durable effects, in any degree indicative of its extreme intensity.

It must not be forgotten that Beckman found that, by exposing phosphorus in nitrogen and other gases, there was deposited upon the side of the glasses opposite to the Light a colored powder, whilst no such effect was produced upon the parts in shadow. In 1801, Ritter, of Jena, repeated the experiments of Scheele, and demonstrated the existence of solar rays possessing very powerful properties in producing chemical change, which do not act sensibly upon the organs of vision, or which, in other words, are not Light-giving rays. Ritter found that the murriate of silver darkened rapidly beyond the violet extremity of the prismatic spectrum. In the violent ray it was less darkened; still less in the blue; below which ray the power of darkening diminished quickly. He also noticed that the red ray had the power of restoring darkened muriate of silver to its original color; and hence concluded that there are two sets of invisible rays, one on the red side of the prismatic spectrum, which favors oxygenation, and the other on the violet side, which assist disoxygenation. Ritter also states,

that he found phosphorus to emit white fumes in the invisible red rays, but that no such effect was produced by the invisible violet rays. Many of Ritter's experiments appear to have been illusive, although some of his conclusions are found to be correct.

In the same year, Labillardiere, in a Paper read before the Philomatic Society, brought forward some experiments to prove that Light was necessary for the development of pores in plants. He states, that blanched plants have no pores; that cresses which were grown in powerful artificial Light had not more than half the number which was found in those plants which had grown under the influence of daylight; and that the coats of bulbous roots have no pores on the parts which were below the ground, whilst they are found abundantly on the parts exposed to the sun. Victor Michellotti, of Turin, published a Paper on the Vitality of Germs, in which he showed that Light is injurious to young plants, and also to young animals. In 1806, Vogel exposed fat, carefully protected from the influence of the air to Light, and it became in a short time of a yellow color: it acquired a rancid penetrating smell and a bitter taste, producing a burning sensation in the throat; whereas that which was open to the air, during exposure, always became acid. The same observer found that ammonia and phosphorus exposed to the sun's rays were rapidly converted into phosphuretted hydrogen and a black powder—phosphuret of ammonia. Vogel also noticed that the red rays of the prismatic spectrum produced no effect upon a solution of corrosive sublimate (bichloride of mercury) in either, but that the blue rays rapidly decomposed it. He also observed that the decomposition of several metallic compounds was gradually brought on by the same class of rays.

It now becomes necessary that we should direct our attention to some most interesting and important discoveries of Sir William Herschel on the heating powers of the different rays of the prismatic spectrum. This is the more necessary, as it will be seen in the sequel, how difficult it is to determine the chemical powers of the different classes of rays, taking the common division of the spectrum into chemical, luminous, and calorific rays.

In the Transactions of the Royal Society of London for 1800, Dr. Herschel's Memoirs on the heating power of the Solar Spectrum will be found. Previously to this time it was supposed that each ray contributed its proportional share to the intensity of the heat which is produced by the concentration of the sun's rays in the focus of a burning-glass. Dr. Herschel was, however, led to suspect that this was not the fact, from the following circumstances:—"In a variety of experiments," says this philosopher, "which I have occasionally made, relating to the method of viewing the sun with large telescopes to the best advantage, I used various combinations of differently colored darkening-glasses. What appeared remarkable was, that when I used some of them, I felt a sensation of heat, though I had but little Light; while others gave me much Light, with scarce any sensation of heat. Now, as in these combinations, the sun's image was also differently colored, it occurred to me that the prismatic rays might have the power of heating bodies very unequally distributed among them; and, as I judged it right in this respect to entertain a doubt, it appeared equally proper to admit the same with regard to Light. If certain colors should be more apt to occasion heat, others might, on the contrary, be more fit for vision, by possessing a superior illuminating power."

The experiments to determine the heating powers of the rays, consisted in passing each ray, through an opening in a piece of pasteboard, and placing delicate thermometers, with blackened balls, so that they could be eradiated with each particular color. The result of these investigations proved, in the first place, that the red rays possessed a greater amount of heating power, than any other of the prismatic colored rays; and, secondly, led to the discovery of "rays coming from the sun, which are less refrangible than any of those that affect the sight," and which have vested amongst them the maximum of the heating power.

"A beam of radiant heat, emanating from the sun," says Dr. Herschel, "consists of rays that are differently refrangible. The range of their extent, when dispersed by a prism, begins at violet-colored Light, where they are most refracted, and have the least efficacy. We have traced these

calorific rays throughout the whole extent of the prismatic spectrum, and found their power increasing, while their refrangibility was lessened, as far as to the confines of red-colored Light. But their diminishing refrangibility, and increasing power, did not stop here; for we have pursued them a considerable way beyond the prismatic spectrum into an invisible state, still exerting their increasing energy, with a decrease of refrangibility, up to the maximum of their power; and have also traced them to that state, where, though still less refracted, their energy, on account we may suppose of their now failing density, decreased pretty fast; after which, the invisible *thermometrical spectrum*, if I may so call it, soon vanished."

Dr. Herschel determined that the invisible rays exerted a considerable heating power, at a point 1½ inch distant from the extreme red ray, even though the thermometer was placed at a distance of 52 inches from the prism.

These experiments were repeated by Sir Henry Englefield, with additional precautions against any source of error, and he found that the thermometer rose as follows:—

In the blue rays in 3′ from 55 to 56 deg, or 1.
Green in 3′ from 54 to 58 deg, or 4.
Yellow in 3′ from 56 to 62 deg, or 6.
Full red in 2 1-2′ from 56 to 72 deg, or 16.
Confines of the red in 2 1-2′ from 58 deg to 72 1-2 deg, or 15 1-2.
Quite out of visible Light in 2 1-2′ from 61 to 79 deg, or 18.

Mr. Berard obtained similar results, excepting that he placed the maximum of heat at the very extremity of the red rays, instead of beyond them. These experiments were afterwards repeated by Sir Humphry Davy at Geneva, who confirmed the correctness of Dr. Herschel's experiments; and still more recently by M. Seebeck, who has shown that the place of maximum heat, varies with the substance of which the prism is made. Seebeck was assisted in his experiments by M. Wunsch; and they came to the following conclusions:

Substance of the Prism.	*Color of Space in which the Heat is greatest.*
Water - -	Yellow.
Alcohol - -	Yellow.
Oil of Turpentine	Yellow.
Sulphuric Acid -	Orange.
Solution of Muriate of Ammonia.	Orange.
Solution of Corrosive Sublimate.	Orange.
Crown Glass -	Middle of the red.
Plate Glass -	Middle of the red.
Flint Glass -	Beyond the red.

In the papers to which I have above referred, Dr. Herschel also describes his experiments to determine the illuminating powers of the different rays. He determined that the yellow and green rays afforded the greatest quantity of Light, and that the violet ray had the least. In conclusion Dr. Herschel asks, "May not the chemical properties of the prismatic colors be as different as those which relate to heat and Light?" How ably this question has been answered by his son, Sir John Herschel, will be hereafter seen.

Sir Henry Englefield, at the suggestion of Sir Humphry Davy, tried several experiments with respect to the power of the several colored rays in rendering Canton's phosphorus luminous. It was found that the blue rays possessed that power in the highest degree, and there was reason to suspect that this power extended beyond the visible violet ray.

About this period Dr. Blackburne put forth a theory that Light was a compound of caloric and oxygen; but it does not appear to have found any supporters. In the consideration of the very remarkable phenomena connected with the changes produced by Light, it will be evident that the heat-giving rays, often very materially modify the results; hence the above sketch of the very interesting discoveries of Dr. Herschel will be found to be perfectly in place.

M Seebeck repeated the experiments of Ritter, and he found that a *colored* impression of the solar spectrum, was made upon paper spread with muriate of silver. In and beyond the violet ray, it became a reddish brown; in the blue, it was blue or bluish grey; in the yellow, it was white or faintly tinged; and in and beyond the red, it was constantly red.

Dr. Wollaston, without knowing what had been done by Ritter, obtained the same results; and he also discovered some new effects, produced by light upon gum guaiacum. Having made a tincture by dissolv-

ing this gum in spirits of wine, he spread some of it upon card-paper, slips of which were exposed to the differently colored rays concentrated by a powerful lens. In the violet and blue rays the gum guaiacum acquired a *green* color; in the yellow no effect was produced. In the red rays the gum already made *green* was restored to its original color. The guaiacum card, when placed in carbonic acid gas, could not be rendered *green* by any of the rays, but was speedily restored from *green* to yellow by the red rays; which change Dr. Wollaston found, could be as readily produced by a heated silver spoon.

In June, 1802, Mr. Wedgwood, the celebrated porcelain manufacturer, published, in the Journals of the Royal Institution, "An Account of a Method of Copying Paintings upon Glass, and of making Profiles by the Agency of Light upon Nitrate of Silver; with Observations by H. Davy." This was certainly the first published account of any attempt to produce images by the decomposing powers of Light. It does indeed appear, that nearly about the same time M. Charles, in his lectures at Paris, proposed to make use of a prepared paper, to produce black profiles by the action of Light, but he died without disclosing the preparation which he employed. Mr. Wedgwood made use of white paper, or white leather, moistened with a solution of nitrate of silver. Notwithstanding the imperfect character of his process, it is so very interesting, as the first attempt at producing pictures by Light, that I shall copy the author's description of it, and some of the remarks from the Memoir. :—

"White paper, or white leather moistened with a solution of nitrate of silver, undergoes no change when kept in a dark place, but on being exposed to the daylight it speedily changes color, and after passing through different shades of grey and brown, becomes at length nearly black. The alterations of color take place more speedily in proportion as the light is more intense. In the direct beams of the sun, two or three minutes are sufficient to produce the full effect; in the shade several hours are required, and Light transmitted through different colored glasses, acts upon it with different degrees of intensity. Thus it is found that red rays, or the common sunbeams, passed through red glass have very little action upon it; yellow and green are more efficacious, but blue and violet Light produce the most decided and powerful effects. * * * * * * * * When the shadow of any figure is thrown upon the prepared surface, the part concealed by it remains white, and the other parts speedily become dark. For copying paintings on glass, the solution should be applied on leather, and in this case it is more readily acted on than when paper is used. After the color has been once fixed on the leather or paper: it cannot be removed by the application of water, or water and soap, and it is in a high degree permanent. The copy of a painting or the profile, immediately after being taken, must be kept in an obscure place; it may, indeed, be examined in the shade, but in this case the exposure should be only for a few minutes; by the Light of candles or lamps, as commonly employed, it is not sensibly affected. No attempts that have been made to prevent the uncolored parts of the copy or profile, from being acted upon by Light, have as yet been successful. They have been covered with a thin coating of fine varnish, but this has not destroyed their susceptibility of becoming colored; and even after repeated washings, sufficient of the active part of the saline matter, will still adhere to the white parts of the leather or paper, to cause them to become dark when exposed in the rays of the sun. Besides the applications of this method of copying that have just been mentioned, there are many others; and it will be useful for making delineations of all such objects as are possessed of a texture partly opaque and partly transparent. The woody fibres of leaves, and the wings of insects may be pretty accurately represented by means of it, and in this case it is only necessary to cause the direct solar Light to pass through them, and to receive the shadows upon prepared leather. * * * * * * The images formed by means of a camera obscura, have been found to be too faint to produce, in any moderate time, an effect upon the nitrate of silver. To copy these images was the first object of Mr. Wedgwood, in his researches on the subject, and for this purpose he first used the nitrate of silver, which was mentioned to him by a friend, as a substance very sensible to the influence of Light, but

all his numerous experiments as to their primary end proved unsuccessful. In following these processes, I have found that the images of small objects, produced by means of the solar microscope, may be copied without difficulty on prepared paper. This will probably be a useful application of the method; that it may be employed successfully, however, it is necessary that the paper be placed at but a small distance from the lens. (*Davy.*) * * * In comparing the effects produced by Light upon muriate of silver with those produced upon the nitrate, it seemed evident that the muriate was the most susceptible, and both were more readily acted upon when moist than when dry, a fact long ago known.—Even in the twilight, the color of moist muriate of silver, spread upon paper, slowly changed from white to faint violet; though, under similar circumstances, no immediate alteration was produced upon the nitrate. * * * * * * * * * Nothing but a method of preventing the unshaded parts of the delineation from being colored by exposure to the day, is wanting to render this process as useful as it is elegant."

The failure of two such eminent men as Wedgewood and Davy, in their attempts to produce Light-drawn pictures, appears to have discouraged any further experiments of this kind at that time in England.

In 1814, M. Niepce, of Chalons on the Saone, turned his attention to the chemical agency of Light, his object being to fix the images of the camera obscura, and he appears to have discovered the peculiar property of light in altering the solubility of many resinous substances. In 1824 M. Daguerre began a series of experiments with the same object in view. The first substances used by him, were, according to M. Arago, paper impregnated with a solution of the nitrate or chloride of silver, but his ill success induced him to abandon them. It is not, however, clear whether any other substances or materials were used by M. Daguerre previously to 1826, when, through a Parisian optician, he became acquainted with M. Niepce. In 1827 M. Niepce was in England, and in the December of that year he communicated an account of his experiments to the Royal Society of London, together with several pictures on metal plates, in the state of advanced etchings, the etching effected by acid, subsequent to that part of the process, in which Light assisted in laying bare portions of the resin-covered plate. These early productions prove, that the experimentalist of Chalons was acquainted with the method of making the shadows and lights of his pictures correspond with those of nature, and of rendering his copies impervious to the erasing effects of the solar rays.

In a paper dated the 5th December, 1829, M. Niepce communicated to M. Daguerre the particulars of the process employed by him, and they entered into an agreement to pursue, for their mutual benefit the researches which they had respectively begun. As many parts of this process of M. Niepce's, and some of his remarks are curious and interesting, I shall devote a brief space to a few extracts from this communication.

"The discovery which I have made," says M. Niepce, "and to which I give the name of Heliography, consists in producing spontaneously, by the action of Light with gradations of tints from black to white the images received by the camera obscura.

"Light, in its state of composition and decomposition, acts chemically upon bodies. It is absorbed, it combines with them, and communicates to them new properties. Thus it augments the natural consistency of some of these bodies: it solidifies them even, and renders them more or less insoluble, according to the duration or intensity of its action.

"The substance which has succeeded best with me, and which concurs most immediately to produce the effect, is asphaltum or bitumen of Judea, prepared in the following manner:—I about half fill a wine-glass with this pulverised bitumen.—I pour upon it, drop by drop, the essential oil of lavender, till the bitumen can absorb no more. I afterwards add as much more of the essential oil, as will cause the whole to stand about three lines above the mixture, which is then covered and submitted to a gentle heat, until the essential oil is fully impregnated with the coloring matter of the bitumen. If this varnish is not of the required consistency, it is to be allowed to evaporate slowly, without heat, in a shallow dish, care being taken to protect

it from moisture, by which it is injured, and at last decomposed. A tablet of plated silver is to be highly polished, on which a thin coating of the varnish is to be applied cold, with a light roll of very soft skin; this will impart to it a fine vermilion color, and cover it with a very thin and equal coating. The plate is then placed upon heated iron, which is wrapped round with several folds of paper, from which, by this method, all moisture has been previously expelled. When the varnish has ceased to simmer, the plate is withdrawn from the heat, and left to cool and dry in a gentle temperature, and protected from a damp atmosphere.

"The plate thus prepared may be immediately submitted to the action of the luminous fluid, in the focus of the camera. But even, after having been thus exposed a length of time sufficient for receiving impressions of external objects, nothing is apparent to show that these impressions exist. The forms of the future picture remain still invisible. The next operation then is to disengage the shrouded imagery, and this is accomplished by a solvent."

This solvent consists of a mixture of one part, by volume, of the essential oil of lavender, and ten of oil of white petroleum. A vessel being procured of a sufficient size, enough of this solvent to cover the plate is poured in. "Into this liquid the tablet is plunged, and the operator, observing it by reflected Light, begins to perceive the images of the objects to which it had been exposed, gradually unfolding their forms, though still veiled by the supernatant fluid continually becoming darker from saturation with varnish. The plate is then lifted out, and held in a vertical position till as much as possible of the solvent has been allowed to drop away." The pictured tablet is now carefully washed by being placed upon an inclined plane, over which a stream of water is carefully poured.

It should be observed that the Light solidifies the varnish, and renders it less soluble than the parts upon which the shadows have fallen. In the same communication M. Niepce says, "It were, however, to be desired that, by blackening the plate, we could obtain all the gradations of tones from black to white; I have therefore turned my attention to this subject, and employed at first liquid sulphate of potash (sulphuret of pôtassium?) But when concentrated it attacks the varnish; and if reduced with water, it only reddens the metal. This twofold defect obliged me to give it up. The substance which I now employ *is iodine, which possesses the property of evaporating at the ordinary temperatures.*" It will be seen that the Daguerreotype process, which derives its name from its discoverer, consists in the application of iodine to silver plates, which is decomposed by the influence of Light.

It appears probable, that the discovery of the Daguerreotype was owing to some observations of Daguerre's, on the changes produced by Light on those silvered plates covered with films of iodine. M. Daguerre, however, appears to imply the contrary, in a note which he has appended to M. Niepce's paper. This heliographic process was exceedingly tedious and uncertain. An exposure of two or three hours was necessary to produce an impression from an engraving, even under the influence of a bright sun; and in the camera obscura, the plate was left under the influence of strong Light for six or eight hours and sometimes even longer, before a tolerable picture could be produced. M. Daguerre materially modified and improved this process. The resin of the essential oil of lavender, dissolved in alchohol, was found by him to be more susceptible of change than the bitumen; and instead of washing the plate with the solvent recommended by M. Niepce, which often removed all the varnish from it, he exposed the tablet to the vapor of petroleum, by which a much more certain effect was produced.

A correspondence between M. Niepce, and M. Daguerre has been published, which sufficiently proves, that to the latter, the sole merit of the discovery of the process which bears his name is due. In 1831-2, M. Niepce indeed regrets, that, at the recommendation of M. Daguerre, he had lost so much time in experiments on iodine. "I repeat it, Sir," he says, "I do not see that we can hope to derive any advantage from this process, more than from any other method which depends upon the use of metallic oxides," &c. &c.—In another letter he speaks of a decoction of thlapsi (shepherd's purse), fumes of phosphorus, and particularly of sulphur, as acting on silver in the same way as iodine,

and that caloric produced the same effect by oxidising the metal, "*for from this cause proceeded in all these instances this extreme sensibility to light.*" We may perceive, from these remarks, that although M. Niepce may not have been fortunate enough to discover the exquisitely sensitive method of M. Daguerre, he must have submitted to experiment, a great variety of substances in different states of combination. The philosopher of Chalons died in July, 1833, and a new agreement was entered into, between his son, M. Isidore Niepce and Daguerre.

In January, 1839, the discovery of M. Daguerre was reported, and specimens shown to the scientific world of Paris.—The extreme fidelity, the beautiful gradations of light and shadow, the minuteness, and the extraordinary character of these pictured tablets, took all by surprise, and Europe and the New World were astonished at the fact, that light could be made to delineate on solid bodies, delicately beautiful pictures, geometrically true, of those objects which it illuminated. In the July following, after a bill was passed, securing to M. Daguerre a pension for life of 6000 francs, and to M. Isidore Niepce of 4000 francs, with one half in reversion to their widows, the process by which these pictures were produced was published. This process will be found particularly detailed in another part of this volume.

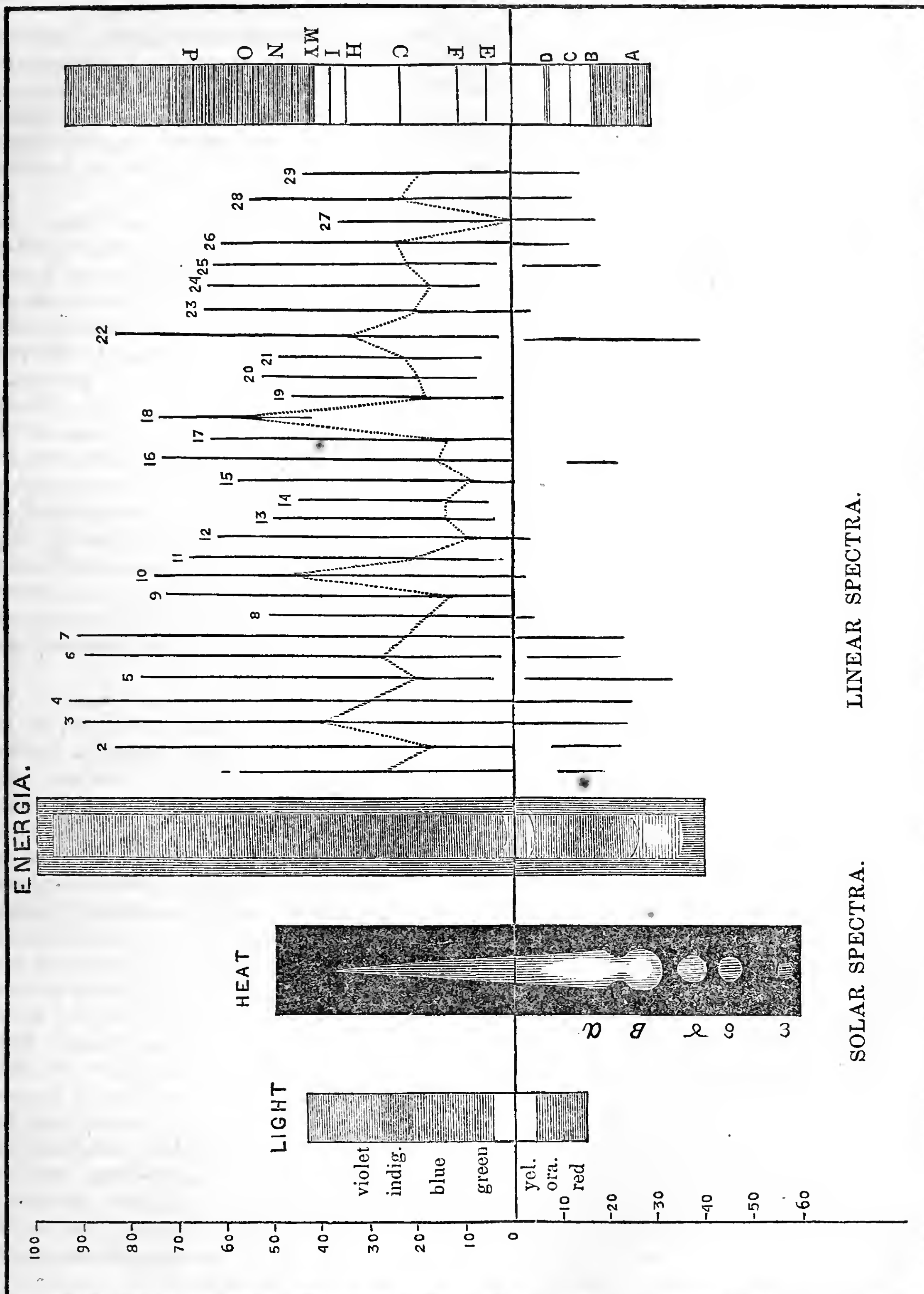
France declares that she purchased the secret of the process of the Daguerreotype for "*the glory of endowing the world of science and of art, with one of the most surprising discoveries that honor their native land.*" "This discovery," says M. Arago, in his place in the Chamber of Deputies, "France has adopted; from the first moment she has cherished a pride in liberally bestowing it—*a gift to the whole world.*" M. Duchatel, Minister Secretary of State, gives as the reason for rewarding the discoverer with a handsome pension, the argument that "*the invention did not admit of being secured by patent, for as soon as published, all might avail themselves of its advantages.*" In the face of this, "on or about the 15th of July, 1839, *a certain foreigner residing in France* instructed, Mr. Miles Berry, patent agent in London, to petition her Majesty to grant her Royal Letters Patent for the exclusive use of the same within these kingdoms." This certainly needs no comment. It is unworthy the liberal spirit which should actuate the follower of science or of art. The patent cannot stand investigation, and it is to be desired that the necessary steps should be taken to set it aside.

In 1834, Mr. Henry Fox Talbot, well known to the world as a natural philosopher, began some experiments with a view of rendering the images of the camera obscura permanent. On the 31st of January, 1839, six months prior to the pubpublication of M. Daguerre's process, a paper, giving an account of Mr. Talbot's labors, entitled, "Some Account of the Art of Photogenic Drawing, or the Process by which Natural Objects may be made to delineate themselves without the aid of the Artist's Pencil," was read before the Royal Society; and in another communication on the 21st of February, 1839, the method of preparing the paper was given, and the process by which the design was fixed particularly described.

It will be evident to all, that the researches of the French artist and of the English philosopher were pursued, without any knowledge of each other's labors. The results in both cases were most satisfactory and they equally rendered most important service to science, in producing an instrument by which the mysterious phenomena of Light could be satisfactorily investigated; and to art, by giving her votaries tablets, upon which Nature impresses herself in all her delicacy and decision, in all her softness and her grandeur, and in all her richness of tone and breadth of effect. Color alone is wanting, and there are sufficient reasons for believing, that in the progress of research we shall, before long, arrive at processes, by which the delightful pictures of the camera obscura, shall be rendered permanent in all the beauty of those glowing tints, which give to the fields of creation their exquisite charm and enchanting character.

During the period in which these interesting discoveries were made, philosophers had observed many other very remarkable phenomena, connected with the chemical properties of the solar beam, particularly the power it possessed of quickening, in an extraordinary degree, the combination of hydrogen and chlorine, which was first

FIXED LINES OF CHEMICAL SPECTRUM.



Salts of Silver.—1 Nitrate; 2 Chloride; 3 Iodine; 4 Iodide and Ferroprusiate; 5 Darkened Silver and Iodine; 6 Daguerreotype Plate; 7 Bromide; 8 Fluoride; 9 Phosphate; 10 Tartrate; 11 Benzoate; 12 Formobenzoate; 13 Benzoate Hyd Benzule.

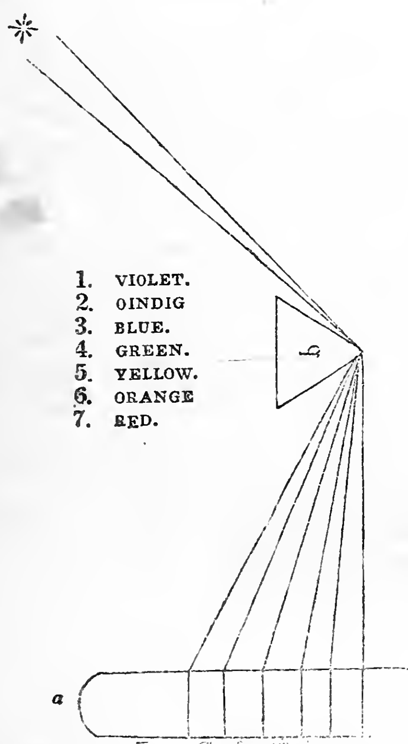
Salts of Gold.—14 Chloride; 15 Protocyanide of Potassium; 16 Protocyan and Formobenzoate; 17 do. and Ammonia; 18 Percyanide of Gold and Ammonia; 19 Platinum Chloride; 20 Mercury Carbonate; 21 Ferrocyanate of Potash; 22 do. and Perchlor Iron; 23 Chromate of Copper; 24 Bichromate of Potash.

Vegetable Compounds.—25 Gum Guaiacum; 26 Corchorus Japonica; 27 Ten Week Stocks; 28 Wall-flowers; 29 Green of Leaves.

[illegible]

noticed by Gay Lussac and Thenard, and also the action of Light in determining the precipitation of platinate of lime, by Sir John F. W. Herschel. As these will be noticed under their respective heads, it will be unnecessary to do more than refer to them in this place. The magnetising power of the solar rays has for many years occupied the attention of the scientific world. The experiments of Dr. Morichini, Carpa, Ridolphi, and Mrs. Somerville, are much at variance with those of Berard, Configliachi, and others.

ON THE DECOMPOSITION OF LIGHT BY THE PRISM.



If a beam of white Light be admitted through a small hole in a window shutter, it will form a round white spot upon the place which it falls. If we interpose a prism of glass, B, so that this beam of Light may fall upon one of its surfaces, as at *a*, the white beam not only suffers a change in its direction, but instead of the round spot of Light, we have an oblong image, composed of seven visible colors, viz., red, orange, yellow, green, blue, indigo, and violet. This lengthened image of the sun is called the *solar spectrum*, or sometimes the *prismatic spectrum*.

In 1666 Sir Isaac Newton was induced to examine this phenomenon, and by many trials he determined the length of the colors to be as follows, whilst the results obtained by Fraunhofer with flint glass prisms are slightly different:—

		Newton.		*Fraunhofer.*
Red	-	45	-	56
Orange	-	27	-	27
Yellow	-	40	-	27
Green	-	60	-	46
Blue	-	60	-	48
Indigo	-	48	-	47
Violet	-	80	-	109
Total length		360		360

These colors are not of equal brilliancy. The red, at the lowest extremity, is very faint, but it gradually increases in brightness, as it approaches the orange. The Light still increasing, arrives at its brightest about the middle of the yellow, from which point it gradually declines, until it is entirely lost in the upper edge of the violet, which is very faint.

Sir Isaac Newton showed, that the different rays of Light had different indices of refraction; the index of refraction for *red* light being the least, and that of the violet the greatest. His celebrated doctrine of *the different refrangibility of the rays of light* is given in a series of propositions, of which the two first will serve our purpose:

"1. As the rays of Light differ in degrees of refrangibility, so they also differ in their disposition to exhibit this or that particular color. Colors are not qualifications of Light, derived from refractions or reflections of natural bodies, but original and connate properties, which in divers rays are divers," &c.

"2. To the same degree of refrangibility ever belongs the same color, and to the same color ever belongs the same degree of refrangibility. The least refrangible rays are all disposed to exhibit a red color, and contrarily, those rays which are disposed to exhibit a red color, are all the least refrangible; so the most refrangible rays are all disposed to exhibit a deep violet, and contrarily, those which are apt to exhibit such a violet color, are all the most refrangible; and so to all the intermediate colors, in a continued series, belong intermediate degrees of refrangibility. And this analogy

between colors and refrangibility is very precise and strict; the rays always agreeing exactly in both, or proportionally disagreeing in both."

Sir David Brewster has shown some reasons for doubting the absolute correctness of this doctrine of Newton's. By examining the action of colored glasses and colored fluids, in absorbing light, he was led to conclude that *green* Light, consists of a mixture of the *blue and yellow* rays, and that *orange* Light is composed of *red and yellow* rays. "It consequently follows," says Sir D. Brewster, "that the orange and green rays of the spectrum, though they cannot be decomposed by prismatic refraction, can be decomposed by absorption, and actually consist of two different colors possessing the same degree of refrangibility. *Difference of color is, therefore, not a test of difference of refrangibility*, and the conclusion deduced by Newton is no longer admissible as a general truth."

Interesting and important as this inquiry is, it belongs rather to another branch of the science, and I have only introduced a notice of these doctrines in this place, to render intelligible, to those who may not be familiar with physical optics, much in the following pages, which might otherwise prove obscure.

It is for the same reason that I introduce a brief notice of the fixed lines in the spectrum. Dr. Wollaston first observed the existence of two fixed dark lines in the spectrum, one in the green and the other in the blue space. Fraunhofer, of Munich, by viewing through a telescope, the spectrum formed from a narrow line of solar Light, by some of his fine flint glass prisms, discovered that the surface of it was crossed throughout its whole length by dark lines of different breadths, none of which coincide with the boundaries of the colored spaces. These lines are nerrly 600 in number.

Seven of these lines, B, C, D, E, F, G, H, from their distances, are particularly distinguished. These are represented in the engraving on page 15. B lies near the outer end of the *red* space, C beyond the middle of the *red;* D in the *orange*, and is a strong double line; E is in the *green;* F in the *blue;* G in the *indigo;* and H in the *violet.* Besides these, there are other lines, which, from their decision, require notice. At A is a well-defined dark line, near the least refrangible edge of the red ray; half way between A and B is a group of seven lines, forming a black band; between B and C are nine lines, and *b* is a triple line in the green; between F and G are 185 lines, and between G and H are 190 of these dark spaces.

Fraunhoffer has given to the world the first numerical estimate, on which any real dependence can be placed, of the illuminating power of the solar spectrum. He places the maximum at M, calling this 100; the Light at other parts will be as follows:—

Light at red end		0·0	Light at	E	48· 0
—	B -	3·2	—	F	17· 0
—	C -	9·4	—	G	3· 1
—	D -	64·0	—	H	0·56
Maximum at M		100.0	Violet extremity		0·00

The heating power of the solar spectrum was, as I have previously stated, examined by Sir William Herschel and by Sir H. Englefield: from their examinations it was found, that rays which had not the power of exciting vision gave the most sensible heat. These are situated below the red ray; but it must be distinctly borne in mind, that these heating rays are disseminated over the whole of the visible spectrum, but as they become mixed with the most refrangible rays, they rapidly decrease in energy.

It will be shown in the following pages, that the rays which are active in producing chemical change, are not, as was formerly imagined, confined to the most refrangible end of the prismatic spectrum, but that they are, under certain circumstances, equally active at the least refrangible end; therefore, although it will, when speaking of the different classes of rays, be convenient to retain the common expressions of chemical, calorific, and luminous rays, it must be understood, that no attempt will be made to define the limits of the calorific or chemical influence. I see reasons for believing that Light, or that agent which affects the organs of sight, is broadly distinguished from those rays which bring heat from its solar source, and both of these classes, from those, which produce those singular changes in the constitution of bodies, which are more particularly the objects of our study.

Sir John Herschel first called attention to a class of rays in the prismatic spectrum,

situated below the ordinary red rays, and which are only seen when the eye is defended from the glare of the other rays, by a deep cobalt of blue glass: these rays will be invariably termed the *extreme red rays.* These rays are situated so decidedly at the extremety of the visible spectrum, that if a dot be made in the centre of the well-defined and round solar image to which it corresponds, and the glass be then laid aside, that dot is judged by the eye to be exactly at the end, or, if anything, rather beyond than within the end of the visible spectrum. (*Herschel.*) It always appears to me as being some lines below the visible red; but I find by experiment, that my undefended eye is not sensible to the red ray so low in the spectrum as many friends have marked its limits. Sir John Herschel has also very satisfactorily shown, that there exists a class of *luminous* rays beyond the violet, which affect the eye with a sensation of lavender grey: these are called by him, in distinction, *lavender rays*, which name is also adopted in the present volume.

[*To be continued.*]

PHOTOGRAPHY, THE HANDMAID OF ART.

BY J. K. FISHER.

The first notion of an uninstructed person, when he sees a work of art, is, that the chief merit and difficulty of it lies in the close resemblance to the object represented. He is astonished, after long acquaintance, to learn that there is far more difficulty in the mere arrangement of the whole, than in the execution of the parts. Such persons, when the Daguerreotype appeared, at once supposed that the perfection of representation would be attained by scientific and mechanical means, and the artist's skill would be dispensed with

But when they got into the chairs of Daguerreotypists, and found themselves pictured with long, important faces, and awkward attitudes, looking like debating politicians attempting to start first speeches, or unpractised lovers struggling to pop the question, or youths sitting for the first time in barbers' chairs to undergo the momentous and man-developing process of shaving; then those over-sanguine persons wondered why they did not get strong likenesses, natural expression, easy attitudes, and other good qualities, which they had always supposed to be easily gotten. The reason is twofold; they could not themselves look like themselves, under the circumstances; and the operators had not the judgment to manage and catch them. So, in most cases, pictures are awkward and affected, and often difficult to recognize.

All this trouble will begin to grow less when operators find out that no one can be a successful Daguerreotypist unless he is an artist, as well as a manipulator. As a mere rhymer is not a poet, a mere talker not an orator, so a mere manipulator is not capable of producing agreeable pictures, however good his subjects may be. A real artist, with the most unpromising subjects, will surpass him. And it will be found, more and more, as Photography advances, that among those who are equal in chemical skill, some will get ten dollars, and others fifty cents, for pictures of the same size, for no reason but because their taste and artistic skill are superior.

But it is not often that artists will apply closely enough to the chemical department to become masters of it. Nor is it absolutely necessary that they should do so; for the requisite skill may be hired for ten or fifteen dollars per week; and the artist may confine his attention to the part which pertains to him, and leave the rest to others who are superior to himself in their way, as much as he is superior to them in his way. Or, if good operators would see their own deficiencies, perhaps they might join in co-partnership with those who would

supply them. The union of artistic taste and science with chemical science and skill would rapidly advance Photography, and make it an invaluable means to cull the beauties from nature, for the use of art, as well as for the gratification of friends.

In some cases, practical artists have turned their attention to daguerreotyping, and their pictures have been superior, in their general effect, to others, although in the chemical effect they might have been far less successful. Among the early experimenters, were some artists and many practical chemists, each excelling in his way, as might have been expected; and a comparison of their productions show that the excellences of the two are required for complete success. But succeeding operators, in most cases, have caught but a smattering of each — a little artistic taste, and a little chemical science and expertness of manipulation; and so we have a multitude of picture makers, of different degrees of skill and taste,—some of them highly respectable, but few indeed who produce such effects as might reasonably be expected from the combination of talent which we have suggested.

But if art is thus required to direct the labors of the Photographer, art itself may receive most useful service in return. We are informed that English artists now go about in the fields with the portable camera and calotype paper, instead of the sketch-book formerly carried; and that such objects as they meet with suitable for materials for their pictures, they seize by this easy and quick process. And it is found to be of great use. The effect of the moment is secured in all its parts; there is no chance for the shadows and lights to change so that the parts may become discordant or out of keeping, as often unavoidably happens in making drawings from landscape. And so in regard to draperies. The stiff artificial log figure, on which drapery never looks natural, is now less used; but the living model sits with the costume required, and all the folds are taken at the same moment, in perfect congruity with each other. From such materials the artist obtains true outlines, true masses of shade and light, and upon this basis the finish is easily given direct from the natural objects.

But artists, as we have said, cannot spare the time necessary to acquire expertness in preparing successfully the delicate and difficult operations of the Photographer.—They want the work to be done for them. In London they buy their paper ready prepared, which they take into the fields, and having there exposed it in the camera, they leave the development of the picture to skillful assistants; and the facility for doing this is an advantage which will probably induce artists to prefer the calotype to the daguerreotype. The photographic paper may be kept for some time without injury; but the daguerreotype plate must be prepared for use, and the developing process performed, nearly at the time of the process in the camera.* With proper Photography, there may be a distinct business, consisting of the preparation of the paper for the camera, and the developing and finishing processes, carried on by good chemical manipulators; while artists, in their own studios, or in the woods and fields, perform the part which pertains to themselves,—the camera operations,—at such times as may suit their convenience.

As to the patent right which restricts the use of the paper processes, we think it applies only to Talbot's. Other preparations, by Hunt, Hemkel, and others, are free; and though they may be somewhat less sensitive, yet, for most uses, they are sufficiently sensitive, and the pictures produced by them are as good as Talbot's. Here, then, is a fair opening for those who can acquire the skill to prepare photographic paper, and perform the other processes of the art. With a small stock of good paper and chemicals, and a few cameras to let, we think they could easily induce artists to try what advantages they might derive from such an aid.

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* This is a slight mistake. We have known plates that have been coated three months to take the impression of an image as perfect as if just coated, and in a much shorter time than usual with the same sensitive. Mr. Claudet, of London, has remarked the same circumstance.—Ed.

From the Hand-Book of Heliography.

HISTORY OF THE SCIENCE.

To whom the honor of discovering this new and important science belongs does not clearly appear.* It has been claimed by natives of both France and England, and with such apparent justice that it is difficult to assign the priority to either. Indeed it would seem that the minds of the respective individuals, who put in a plea for reputation on this score, were engaged so much about the same time on the matter, that the three principal candidates appear all equally entitled to it; the distance from each other being so great that a supposition of collusion amongst them cannot for a moment be entertained. These individuals are MM. Niepce and Daguerre in France, and a gentleman of the name of Talbot, in England. But, if the latter be indeed entitled to the credit of an inventor of this beautiful art, the productions of the former evince so much more proficiency and perfection that we cannot but concede to them the palm of superiority.

Our own countryman, the celebrated Dr. Ure, author of the Cyclopædia of Manufactures, in his excellent but frequently unjustly abused work on geology, published some years since, laid down in an admirable but apparently too abstruse chapter on *light*, which he prefixed to the body of his work, the law of the effects of coinciding rays, and clearly showed, by an experiment familiar to the comprehension of all, and easily made by any one, that its effect is to produce darkness, just as certainly, and just as palpably, as the effect of parallel rays from the sun is to produce light. But he was not probably aware at the time that the darkness resulting from coincident rays was not only a mechanical consequence, if we may so speak, but that rays of light possessed and evinced a *chemical* property—that of rendering the darkness permanent upon any substance which was fitted to receive and competent to retain it. We do not say that the doctor was the first to discover the faculty of light of which he speaks, but he was the first to make it popularly, and, therefore, generally known, and too much praise cannot be ascribed for the singular perspicuity by which he has made it evident.

Giovanni Baptiste Porta, a Neapolitan physician, about two centuries since, discovered that, if light were admitted through a small circular aperture into a closely shut room, all the objects without from which reflected rays reached the hole would be painted on the opposite wall, in strength and size according to their distance, with their forms and relative situations, as in an extended picture, with the most precise exactness. He subsequently found that the hole need not be very small but that in fact it might be of any size, if covered with a lens. This was, however, only doubling the contrivance; for the increased quantity of light, which the larger hole afforded, was of course condensed by the centralizing power of the lens. But the images produced by these simple means were faint and somewhat confused, while those effected by aid of the lens were proportionably intense and properly defined. This plainness became remarkably increased after the discovery of the achromatic lens; and, still more, when subsequently the periscopic lens was applied, the additional force of the effect in consequence of its focalizing power was truly astonishing.

Porta had several dark chambers constructed of a cylindrical form of any particular length, with a lens at one end and a white card or paper at the other, so placed as to be within the focus of the glass upon which the external images were depicted. This plan he intended for such persons as knew not how to draw; so that we have here the almost perfect design of the instrument of *Daguerre*.

He conceived that to obtain perfect representations of the most complicated sets of objects, it was only necessary to follow the focal light with the trace of a crayon. In this idea, however, he was not precisely correct; for painters and designers, especially those who were engaged on large works, such as panoramas and dioramas, and

* Yet we think it does from this very article.—*Ed.*

who used the dark chamber found that it was only useful for defining objects in the mass, to give them the respective sizes and positions according to rules of linear perspective; but to the effects of what is called *aerial perspective* they found the dark chamber completely incompetent. Nor could their utmost efforts avail them to any requisite extent, or render what they did accomplish of permanent use. This object, however, has at length been attained, and he who, perfectly ignorant of the art of drawing, is destined to wander to the remotest corners of the earth, may now without the aid of an artist, carry with him the true and faithful delineation of the home of his youth, and of the objects most dear in his earliest recollections, with a truth and fidelity that no manual operation could imitate.

Alchemists, in those fruitless attempts after the *elixir vitæ*, and the transmuting stone, which formed the foundation of the present invaluable science of chemistry, succeeded in uniting silver with a marine salt, and produced a combination called *lune* or *argent corne*. In the work of Fabricius, "*De rebus metallicis*," published in 1566, a substance of this kind is especially noticed. It had the color and transparency of horn, and the fusibility and softness of wax, but, if exposed to the light, changed nearly to violet, and by the continued action of the same influence, became nearly black. This was the natural *argent corne* or *lunar caustic*.

The salt produced by the alchemists possessed the remarkable property of turning black, and the blackness was vivid just in proportion as the rays which occasioned it were powerful. Cover a sheet of paper with a coating of *argent corne*, or, as it is now called, *chloride of silver*. Obtain by the aid of the lens the form of some object upon this coating, and the parts occupied by the figure will change to a dark color, while the remainder of the paper, or rather its coating, will continue white.—The parts which have a strong cast of light upon them will become quite black, the half tints and shades being formed by grey, through a less forcible luminence.

Place an engraving upon the paper covered with chloride of silver, and expose it altogether to the sun's rays, the engraving being uppermost, and that part of the paper covered by the engraving will remain white, in consequence of the interception of the rays, which cannot, on that account reach the coating of chloride; while all the rest will be tinged with black. Where the paper on which the engraving is printed has retained its semi-transparency, the saline coat will be obscured accordingly; the result being that the coating on which the operation creates its effect will have its forms and shades in an inverse manner; the darkest parts of the engraving being whitest on the chloride, and the lightest parts of the print the darkest on the paper.

It might have been supposed that in the possession of so complete a knowledge of the effects of light upon this chloride, the alchemists would in the course of time have carried it out to some real practical purpose. But the minds of those men were too abstract, were too much occupied in the absorbing pursuit of the high, and, to them, incomparably more interesting and important design of realizing a most fascinating though visionary object. They thought that if they could attain this great good, all other benefits would naturally follow; and, if their premises had been correct, their conclusion would have been both wise and sound. They were lifted above all the considerations of ordinary life and common objects, and it therefore remained for the nineteenth century to conceive and accomplish the photogenic art.

M. Charles, a Frenchman, succeeded in obtaining *silhouettes*, or black profile portraits, but he never made known the nature or steps of his process, and his secret died with him. The first authentic intimation of this new art was contained in a memoir of Mr. Wedgwood, the celebrated improver of the manufacture of porcelain in this country, whose paper appeared in the June number of the Journal of the Royal Institution in 1802. The author was desirous of obtaining by the assistance of paper, prepared with chloride or nitrate of silver, the representations of church windows, as well as of engravings, for his pottery; and, though he appears to have adopted a very close approximation to the present practice, he failed in his chief design. He says, "the images formed by means of a camera obscura have

been found to be too faint to produce, in any moderate time, an effect upon the nitrate of silver."

Wedgwood's celebrated commentator, the illustrious Sir Humphry Davy, did not contradict the assertion relative to the camera obscura. He added that he attempted to copy very small objects by a solar microscope, but only at a very short distance from the lens. Neither Wedgewood nor Sir H Davy, discovered an expedient for preventing the borders of their drawings from turning black. Their copies in consequence never could be examined in broad daylight, for, as soon as they were exposed to its strength of action, the whole of the paper began to assume one uniformly dark tinge.

After these imperfect and insignificant results, nothing was attempted until the researches of MM. Niepce and Daguerre. The former of these two gentlemen was a retired man of business in the neighborhood of Chalons-sur-Saone, who devoted his leisure to scientific inquiries, and his first experiments in photography, or making permanent marks by the aid of light, appear to have been made as early as 1814; but his first connection with M. Daguerre took place in the month of January, 1826. Through the indiscretion of an optician at Paris, he became apprised that M. Daguerre was endeavoring to accomplish the same object as that to which he had devoted his attention; having only to fix the images of his design in the dark chamber to make his plan perfect. These facts are verified by letters, still in existence, which attest that the earliest works of M. Daguerre were effected in 1826.

In 1827, M. Niepce came to England, and in December of the same year he presented a memoir upon this subject to the Royal Society of London. His paper was accompanied by many illustrations upon metal produced by the methods which he had discovered. These illustrations, which are still in good condition, might be gathered from the several scientific collections of distinguished Englishmen, and prove, without the possibility of contradiction, that engravings could be copied, and were so, by means of photography, in 1827. They present the appearance of advanced sketches produced by means of a graver. M. Niepce knew, in 1827, how to make shades correspond to shades, half-tints to half-tints, and lights to lights; and, above all, he knew, when he had accomplished his object of copying an engraving, how to make that copy insensible to the subsequent and blackening rays of the sun; thus resolving, as his self-lauding countrymen phrase it, a problem which had defied the sagacity of Wedgwood and the genius of Davy.

The registered deed of partnership between MM. Niepce and Daguerre is dated 14th December, 1829; and they thenceforward prosecuted their photographic inquiries together. Subsequently the son of M. Niepce took the place of his father in the engagement. In the body of this document, the several portions of the discovery are accorded to the respective parties to the contract, and it contains the remarkable assertion that the discovery of M. Daguerre had elicited a process which "reproduced images with sixty or eighty times the force of the previous plan."

In speaking all along as we have done of the proceedings of M. Niepce, it is particularly necessary to observe the words of the contract, "*pour la copie photographique des gravures*"—the photographic copy of *engravings;* for, after a number of fruitless essays, M. Niepce had nearly renounced the attempt of producing images from nature. He could not *create* a design. He could copy engravings, but he could not transfer the images of natural objects. The preparations of which he made use failed to render the dark marks sufficiently strong under the influence of the light. He succeeded in giving parts of a scene or of a landscape with sufficient power, but there was nothing complete. Here and there everything was boldly portrayed, but in other places there was a poor and insufficient representation; and, between, were places, comparatively of considerable size, exhibiting gaps which entirely destroyed the effect or rather the appearance of a picture. On the other hand, we ought to give an enumeration of the discoveries which after many *minute* and painful and varied efforts M. Daguerre had made.

M. Niepce dissolved some dry bitumen of Judea in oil of lavender, and, after evaporation, the remainder was a thick varnish, which he spread upon a polished metallic plate, as, for instance, of plated copper, or

upon a plate of silver. The plate, after being submitted to a gentle heat, remained covered with a white and adhering powder, which was bitumen in powder. The plate, thus prepared, was placed upon the hearth of the camera obscura. After a certain time, the feeble lineaments of an image might be perceived. M. Niepce ingeniously conceived that these traits, so little perceptible, might be materially strengthened. In fact, after plunging the plate into a mixture of oil of lavender and rock oil, he observed that the portions of the covered plate which had been exposed to the light remained nearly untouched, while, on the others the covering rapidly dissolved and left the plate almost naked. After having washed the plate with water, he had the image formed in the camera obscura, the lights corresponding to the lights, and the shades to the shades. The lights were formed by the diffused light proceeding from the bitumen; the shades, by the parts polished and become denuded, which was, it should be observed, so skillfully managed that parts of the sombre objects reflected themselves in a glass; provided also, that they were placed in such a position that they were not directly opposite to the mirror, but aslant, with an oblique aspect and a faint light upon them. The half-tints, where they were perceptible, or existed at all, resulted from that part of the varnish where a partial penetration of the dissolvent had rendered it less solid than those parts which were untouched.

The bitumen of Judea, reduced to an impalpable powder, had no clear whiteness about it; it would indeed be almost exceeding the truth to call it gray. Contrast between the lights and shades of these designs of M. Niepce's was consequently far too weak for the desired, and, we ought to say, necessary effect; and, to increase it, he thought of strengthening the blacks in the plate by an after-influence, obtained either by sulphuret of potash or iodine. But he does not appear to have known that the latter of these two substances, when exposed to the light of day, would have been subject to continual change. He could not pretend to preserve so sensitive a thing as iodine; he only wished to apply it to the surface of the blackening substance, and that, too, after the formation of the image in the dark chamber. In such an operation what would have become of the half-tints!

To the number of these great inconveniences of the method of Niepce's should be added the circumstance that, if the dissolvent were too strong, it would sometimes raise the varnish in places; after a little, indeed, entirely; if too weak, it would not sufficiently disengage it from the image. Success was never certain.

M. Daguerre conceived a method which he called Niepce's plan completed. He at first substituted the residuum of the distillation of oil of lavender in bitumen, on account of its greater whiteness and sensibility. That residuum was dissolved in alcohol, or in ether, and the liquid was deposited in a very thin layer upon the metal laid horizontally, and prepared to receive it; and it left, in evaporation, a uniform pulverulent covering, a result which was not obtained by the process of Niepce.

After the exposure of the plate, thus prepared, to the heat, and in the dark chamber, M. Daguerre placed it horizontally, and at a distance, above a vessel containing essential oil at the ordinary temperature. The vapor proceeding from the oil left the particles of the pulverulent plaster which had experienced the action of the strong light untouched. It penetrated partially, and more or less, the portions of the same covering which in the dark chamber corresponded to the dark tints. The parts remaining in shade were penetrated entirely. Here the metal did not show naked in any part of the design; but the lights were formed by the agglomeration of a multitude of white and macerated particles; the half tints by particles equally condensed, but in which the vapor had more or less weakened the whiteness and destroyed the closeness; the shades by particles always in the same number, but become entirely transparent.

More of effect, a greater variety of tones, more regularity, certainty of success in the process, as well as of avoiding carrying away any portion of the image, were the advantages of M. Daguerre's modified method. Unfortunately the oil of lavender, which is more sensible to the action of light than the bitumen of Judea, is yet so slothful in its action that the design does not begin to form until after a very long time.

The kind of modification which the residuum of the oil of lavender receives by the action of light, and in consequence of which the vapor of the essential oil penetrates its substance with more or less facility, is still unknown to us. Perhaps we should regard it as a simple detachment of particles, perhaps as a new arrangement of molecules of the matter. This double hypothesis would explain how the modification is gradually weakened and at length disappears.

Through a long course of observation Daguerre saw the reasons of his repeated failures, and, by indomitable perseverance and the exercise of ingenuity, he at length so far overcame them as to bring his invention to a practical state.

He put upon the surface of a metallic plate, the tablet which receives the images, a coat of gold yellow, and then, turning it downwards, placed it horizontally in a box at the bottom of which there was a little iodine undergoing spontaneous evaporation. When this plate comes out of the dark chamber, not a trace can be seen upon it. The yellow coat of the iodine of silver, which has received the impress of the figure, is one uniform dark shade without any mark.

Next, the plate is exposed, in a second box, to an ascending mercurial vapor which raises a capsule, when the liquid is coming upwards, by the action of a spirit lamp, and this vapor immediately produces a most curious effect. It becomes attached in abundance to the parts of the surface of the plate which have been exposed to a strong light, while those parts which have been left in the shade remain untouched; at length it begins to work upon the space occupied by the half tints, and in a greater or less degree makes its impression upon the plate, and according to the intensity of the light on the precise spot makes it either more or less dark. When the feeble light of a candle is used, the operator can follow the gradual formation of the image step by step. He will be able to perceive the mercurial vapor, like a delicate graver, mark each part of the plate with the proportionate depth.

The image being thus produced in the camera, what should hinder its alteration when exposed to the light of day was a question that very naturally proposed itself to the mind of the inventor. This he accomplished by immersing the plate upon which the design had been effected in hyposulphite of soda, and afterwards washing it with hot distilled water.

M. Daguerre says that the image is obtained better on a surface of plated metal, *i. e.*, upon a plate of copper covered with silver, than upon one of silver alone.—Should such be the case, it seems to prove that electricity plays a considerable part in the operation.

The plate should be first rubbed with rotten stone, and then cleaned with nitric acid diluted with sixteen parts of distilled water. The influence which the acid exercises in this part of the process is both singular and useful: it raises little molecules of copper on the surface of the silver.

Although the thickness of the slight coat of iodine, as the several considerations of M. Dumas show, would not be more than the millionth part of a millemetre, it is necessary for the due proportion of light and shade that it should be perfectly even in every part. He prevented a greater deposit of the iodine upon the borders than upon the centre of the plate, by putting round it a slight frame of the same metal, which he affixes by nails to the tablet of wood which bears the whole. But as yet we are unable to explain the mode of physical action of that plate satisfactorily.

There is another circumstance not less mysterious. If it be desired that the image should produce the maximum of effect in the ordinary vertical position of the tables, it is necessary that the plate should be placed at an angle of 45 degrees to the ascending vapor. If the plate is horizontal at the moment of the precipitation of the mercury, it would be necessary, on the formation of the image, to look at it in an angle of 45 deg., and in order to obtain the best view of the representation.

In attempting to explain the singular process of M. Daguerre, the idea is immediately presented to the mind that light in the camera occasions the vaporization of the iodine, wherever it has come in contact with the gilt plate; that the metal becomes denuded, and that the mercurial vapor acts freely on the naked metal, during the second operation, and produces a white and pasty amalgam; that the washing of the

hyposulphite is intended to raise the parts of the iodine which the light has not disengaged, and, speaking artistically, to make those parts of the plate bare which should produce the shadows.

The plate is not apparently increased in weight by the yellow covering of iodine, while, on the contrary, it is so, very perceptibly, under the action of the mercurial vapor. M. Pelouze, an ingenious Frenchman, who has taken considerable pains in this invention, asserts that, notwithstanding the presence of a little of the amalgam on the surface, the plate weighs less after the operation than it did before. It would consequently appear that the hyposulphite disperses part of the silver, and a chemical examination confirms the correctness of the supposition.

To assign a reason for the effect of light on the designs which M. Daguerre submitted to its effects, it seems sufficient to admit that the plate of silver becomes covered, during the operation of the mercurial vapor, with spherules of the amalgam; that these spherules, very close in the lights, gradually diminish in the half tints towards the dark parts, where there ought not to be any.

The supposition of the philosopher has proved correct. M. Dumas discovered, by the microscope, that the light and half tints are really formed by spherules, the diameter of which appeared to him, as well as to M. Adolphe Brogniart, to be almost invariably about the eight-hundredth of a millemetre, but still the necessity of presenting the plate on the precipitation of the mercurial vapor at a *dip* of 45 deg. remains to be accounted for. It has been rationally supposed, that is, conceiving this inclination to be indispensible, to indicate the presence of points or prisms of crystallization, which solidify and group themselves vertically in a complete or semi-liquid, and thus have an inclination relative to the position of the plate to such an extent as renders that inclination of the plate necessary.

Our uncertainty respecting this matter only shows how far as yet we are from understanding the mode of action and the nature of this beautiful and highly important instrument of art.

We have thought it better to follow the invention from its rise through the several stages of its practical process, in order to make the reader clearly acquainted with the nature of the science, or, at least, as clearly as established facts can exhibit it. The matter itself was of such a curious and recondite character that few had ever imagined its existence. On this side of the Channel there was but one person who appears to have had any correct apprehension of the action of light, and the results which he obtained were so faulty and incomplete that they were not to be compared with the draughts of the French artists.

Mr. Talbot had submitted a description of his operation to the Royal Society of London, of which he is a fellow, some short time previous to the art of Heliography being publicly talked of in France, and he has given good evidence to show that he had been acquainted with the principles for nine or ten years before. Some attempt has also been made by the Americans to arrogate the honor of the discovery to themselves, but these were but coldly received, and have at length, apparently, altogether died away.* Mr. Talbot, with a generosity that does him high honor, exposed the whole of his plan to the public, and explained every part of it, so sufficiently, indeed, as to enable Messrs. Ackermann, of the Strand, to fit up boxes whereby any person of only common intelligence might make photogenic drawings for himself.

M. Daguerre, in the meantime, had submitted his designs and explanations to the Chamber of Deputies, with a view to obtain from the French Government a compensation for making the whole process of his invention public, in order to render it of general and immediate utility, and a commission was appointed to examine the project of law for this purpose. After sufficient inquiry, a report was made to the Chamber of Deputies by the celebrated philosopher, M. Argo, and another to the House of Peers by M. Gay-Lussac; by which it appears that, after having had every opportunity of testing the certainty of the process, they were convinced of its capability to effect that which the inventor

* In our work on the Art of Photography, we published an account of the early efforts of Mr. Wattles, which prove the Americans have a much greater right to claim priority to the invention than either English or French. We arrogate nothing, —we now claim it unqualifiedly.—Ed.

said it would accomplish. During the inquiry, M. Daguerre operated in the presence of one of the members of the commission, and made that gentleman as well acquainted with it as himself. In consequence of their reports a resolution was passed granting to M. Daguerre a pension of 6,000 francs per annum, for life, and another of 4,000 francs to the son of M. Niepce, who had been joined with M. Daguerre in the attempt to bring the invention to a satisfactory issue since 1829, he having at that period taken his father's interest in the affair. The pension to M. Daguerre was afterwards increased to 10,000 francs, and the law received the royal assent on the 15th of June, 1839.

How far M. Daguerre might have gone on in the improvement of his plan it is impossible to say, for, when on the high tide of successful operation, his diorama, with the whole of his plans and means of operating, were unfortunately reduced to ashes by an accidental fire. But he has already a very eminent degree of success, and not only himself produced surprising results, but by his proceedings has called the attention of many able and scientific men to the subject, and thereby insured the certainty of progressive improvement.

It remains perhaps that we should say some little of the inventor of photogenic drawing. M. Daguerre, then, is an artist of considerable celebrity as a painter, and has long been an esteemed member of the French Academy of Fine Arts, and of the Academy of St. Luke, as well as of other institutions of a similar character in his own country, and stood high in France long before his discovery of the science of which we treat extended his reputation beyond the bounds of France. He is much regarded for his natural goodness as well as his artistical powers, especially for that surest indication of true genius, modesty.

When, on the 19th of August, 1839, in accordance with his agreement with the Chambers of Legislature, the discovery was to be made known, no inducements could prompt him to make his own explanations; and M. Arago, of whom we have spoken above, as being one of the reporters on the commission, was obliged to undertake the task of making the public acquainted with the secret of the process. In stating these circumstances to the assembly who attended on the occasion, this great man, as all Europe acknowledges him to be, with a feeling that does him infinite honor, after reporting his endeavors to induce M. Daguerre to appear in that place, said, "a little too much modesty, a burden which is generally so lightly borne, suggested obstacles which I was not so happy as to surmount." His substitute, however, as might have been expected, proved satisfactorily competent to the task he had undertaken.

As it may be interesting to our readers, and will serve to complete this hasty sketch of Heliography, we subjoin the royal ordinance to the Chambers, which runs as follows:

"Louis Philippe, King of the French, to all to whom these presents shall come.

We have ordered, and do order, that the bill which shall be presented to the Chamber of Deputies by our Minister, Secretary of State for the Interior, in our name, be explained by him and supported in the discussion.

Art. 1. The agreement concluded on the 14th June, 1839, between the Minister of the Interior, acting in behalf of the State and MM. Daguerre and Niepce, jun., is added to the present law, and approved.

Art. 2. There is granted to M. Daguerre an annual pension, for life, of 6,000 francs, and to M. Niepce, jun., an annual pension, for life, of 4,000 francs.

Art. 3. These pensions shall be entered in the book of civil pensions of the public Treasury, with an enjoinment that they shall be published with the present law.—They shall not be subject to the prohibitive laws of accumulation. Reversions of one half shall be settled on the widows of MM. Daguerre and Niepce

Given at our palace of Tuileries, on the 15th June, 1839.

Signed. Louis Philippe.

Witnessed. Deuchatel."

In compliance with this ordinance, a law was passed, founded upon and embracing the following agreement.

"Between the undersigned, M. Deuchatel, Minister, Secretary of State for the Department of the Interior, on the one part, and MM. Daguerre, (Louis Jacques Mande), and Niepce, jun., (Joseph Isi-

dore), on the other part, the following has been agreed upon.

Art. 1. MM. Daguerre and Niepce jun., have ceded to M., the Minister of the Interior, acting on behalf of the State, the process of M. Niepce, sen., with the improvements of M. Daguerre, and the later process of M. Daguerre, for fixing the images of the camera obscura. They engage to deposit in the hands of M., the Minister of the Interior, a sealed packet containing the history and exact and complete description of the said processes.

Art. 2. M. Arago, Member of the Chamber of Deputies, and of the Academy of Sciences, who has taken a knowledge of the said processes, has verified beforehand all the portions of the said processes, and has testified to the correctness of the representations.

Art. 3. The packet shall be opened, and the description of the processes published, after the adoption of the Bill, which is spoken of above. M. Daguerre will then, if it is required of him, operate in the presence of a commission named by the Minister of the Interior.

Art. 4. M. Daguerre engages, besides, to give a description of the peculiarities which distinguish the painting of the diorama.

Art. 5. He shall be bound to make known all the improvements which he shall make, from time to time, in any or all of these inventions.

Art. 6. As the price of these concessions the Minister of the Interior engages to require of the Chambers, for M. Daguerre, who accepts it, an annual pension of 6,000 francs for life, and for M. Niepce, who agrees also to accept it an annual pension of 4,000 francs for life.

These pensions shall be entered in the Civil Pension Book of the Treasury. They are not to be subject to the laws which prohibit accumulations; and a reversion or a moiety of each pension, respectively, is settled upon their several widows.

Art. 7. In the event of the Chambers not adopting, during the present session, this project of law granting these pensions, this agreement shall be null and void, and MM. Niepce and Daguerre, shall have their packet returned to them unopened.

Art. 8. The present agreement shall be registered on payment of one franc.

Made triple at Paris, 14th June, 1839.

Signed by M. Deuchatel, M. Daguerre, and M. Niepce.

An exact copy of the original has been annexed to the project of law.

Signed. DEUCHATEL.
Secretary of State for the Interior.

NOTE BY THE EDITOR.—Our author has entirely overlooked the successful experiments of Professors Morse and Draper of New York, in Heliography, and as their attempts to take portraits by Daguerre's method were the first resulting in entire success, we think they deserve quite as much consideration and credit, if not more so, than any of the English experimentalists.

Robert Hunt, in his works, frequently quotes Professor Draper, and thus evinces towards American authors a more liberal and gentlemanly spirit than Englishmen generally. They talk and write a great deal about Americans repudiating their state bonds, but we know of no class more given to repudiating scientific and literary debts than these self-same English authors.

No sooner had Daguerre published his system of Photography, than both Professors Morse and Draper turned their attention to the subject, and in a very short time produced the first portraits from living objects. As we intend to publish, in the columns of our Journal, a complete history of the art in America, we shall defer further comment at present.

NATURE AND OBJECTS OF THE SCIENCE.

The several names which this new science has received are so correctly indicative of its nature that they may be said to be definitions of it. It was first called *photography*, from two Greek words, signifying, writing by light; it was then called the art of *photogenic drawing*, or drawing produced or occasioned by light; and, at length, M. Daguerre gave it the equally expressive, though not more appropriate, name of *Heliography*, or, *writing by the sun;* the two last appellations, like the first, being derivatives from the Greek.

An idea had long been entertained that there was some method by which the fleeting representations of outward objects might be retained and made steadfast, but it seemed too flimsy to be held by a rational philosopher. The researches of late years into the chemical combinations of light, however, and the observation of its

effects upon the colors of natural objects, had confirmed the notion that there was a possibility of fixing its impress, and it was known that wherever light had fallen upon the substance designated *nitrate of silver*, or upon any thing rubbed over by it, a black mark was left.

The object of this science, then, is to fix the figures and colors of objects upon a prepared surface by the reflection of light alone. By the well known and beautiful invention, the *camera obscura*, the appearance of objects external to the box or place which contains the apparatus is beautifully exhibited on an horizontal plane, in their just proportions, colors, and perspective. Every portion of the scene, however minute or obscure, is faithfully depicted and retained as long as the observer may choose. Here then was a means by which the representation was secured for any desirable length of time, so that if there was a power in light to leave the trace of the physical things which it clad in beauty, it might by this means be secured. The substitution of a substance which, when submitted to the action of light, retained its impress, for the plain glass of the camera sufficed to accomplish the purpose of a retention of the image depicted.

But something more than this was required, for either the drawing must be kept in the dark, or the whole of the surface prepared would, on exposure to open daylight, equally partake of the same dark hue. Instead of exhibiting all those objects of every form, variety and character, of which the human mind is cognizant, by the tracing of characters upon the black paper, it would be smearing the whole surface with one unseemly blotch. The means, however, adopted by Daguerre, for securing the permanency of the marks, prevented this fatal fault, and rendered the science truly what it is called, *Heliography*. Such is the simple nature of one of those important discoveries which are occasionally promulgated to the world. The full power and utility of the science of Heliography may not be developed until the present generation has passed to their last resting places, and a longer period will assuredly elapse before its universal adaptation to the several purposes for which it is fitted.

But of its capacity for service, no small prospect may now be obtained, and it appears to have been well appreciated by the enlightened individuals who constituted the commission of the French legislative chambers. Their thoughts are so happily expressed that we cannot do better than transcribe them, especially as the important matters to which they refer are such apt illustrations of the benefits of the science that better could hardly have been selected.

" Your Commission have made the necessary dispositions for the day of discussion of the law (of granting a pension to the inventors); for all the members of the Chamber, if they think convenient, may appreciate the results of the Daguerreotype, and form for themselves a notion of the utility of such an apparatus. Every one will be able, upon an examination of many of the pictures which will pass under your eyes, to judge of the immense advantages which would have been derived during the expedition in Egypt, from so prompt a means of drawing such exact representations; and each will be struck by the reflection that, if photography had been known in 1798, we should to-day have possessed faithful depictions of a good number of emblematic pictures of which the cupidity of the Arabs and the Vandalism of others have deprived the world.

" To copy the millions upon millions of hieroglyphics which cover even the exterior of the great monuments of Thebes and Memphis, of Carnac, &c., would require scores of years, and legions of designers.—By the assistance of the Daguerreotype a single man could finish that immense work. Supply the institute of Egypt with two or three of the apparatus of M. Daguerre, and upon most of the great plates in that celebrated work (the fruit of our immortal expedition) of the vast extent of real hieroglyphics, these instruments would replace these fictitious or invented representations; and the designs would surpass, above all conception, in fidelity, and peculiarity of tint, the works of our most able painters. The photographic images, being subject in their formation to the rules of geometry, would through the aid of a small number of data admit of coming at the exact dimensions of the most elevated and inaccessible parts of those edifices.

" These reminiscences in which the sa-

vans and artists, so zealous and celebrated, who were attached to the army of the east, could not, without strange mistake, find the shadow of blame, will without doubt recall the thoughts to the works which are at present executed in our own country, under the control of the commission of Historical Monuments. At one glance any one will perceive the immense and important influence which the photographic processes are destined one day to exercise upon that great national enterprise; each will comprehend how much these novel modes of proceeding are distinguished by economy, a species of merit which rarely advances with the arts in the perfecting of their products.

"If it should at length be asked, if the art, defined in its very appellation, can bear the examinations of its productions, those productions which are formed by the most subtle and delicate agent that nature offers, rays of light, M. Paul Delaroche shall answer.

"In a note replying to our request, that celebrated painter declares, concerning the process of M. Daguerre, that it so far contains the perfection of certain conditions essential to the art that they would become even to the most accomplished painters, a subject for observation and study! That which struck him in the designs is an *inconceivable precision*, nothing that disturbs the tranquillity of the masses, nothing that in any manner obscurates the general effect.

"'The correctness of the lines, besides,' says M. Delaroche, 'the precision of the forms, is as complete as possible in the designs of M. Daguerre, while at the same time, there may be recognized a model of a large object, forcible and like, as rich in tone as effect. The painter would find in the process a prompt means of making a collection of studies, which he could not obtain otherwise but with the expenditure of much time, with much labor, and in much less perfection, setting aside the necessity for his own talent.' After having combatted, by excellent arguments, the opinions of those who imagine that photography would be injurious to our artists, and especially to our engravers, M. Delaroche concludes his note with this remark, 'To resume, the admirable discovery of M. Daguerre is an immense service rendered to the arts'

"We can commit no error in adding nothing to such evidence."

Nor can we; for a better illustration of the object of the Daguerreotype than the whole of this extract furnishes could not have been given. But as one circumstance, which beautifully proves the *necessity*—for such we may call it,—that exists for the exceeding delicacy of the designs produced by this instrument, we may state that the exceeding thinness, the almost inconceivable tenuity of the coating of nitrate of silver, to speak simply, *obliges* a remarkable fineness in every part of the product; a coarse representation could not be produced at all, there must be either a *fine* design or none; for a coarse representation could not but become no picture or representation, for it must evince such confusion in the details that the outline of no object whatever could be perceived.

But one of the greatest advantages of the Daguerreotype consists in this, that it acts with a certainty and extent to which the powers of human faculties are perfectly incompetent. Not only does it delineate every object presented to its operation with perfect truth in their proportions, perspective, and tint—an attainment to which artists could never quite arrive, though which some of them of first-rate genius, after long and indefatigable labor, might perhaps so closely imitate as to satisfy, if not deceive, the casual observer — but it lays down objects which the visual organs of a man would overlook, or might not be able to perceive, with the same minuteness, with the same particularity, with the same nicety, that it depicts the most prominent feature in the landscape. The leaf of a rose, the blades of grass, the neglected weed, the time-stained excrescences on the knarled oak tree trunk in the landscape, and the smallest filament of tracery in the entablature, or in the representation of human passions on the loftiest point of a carved pediment of a temple, could be traced with the same accuracy, in every respect, as the varied workings of the soul in the countenance of the hero of the piece; and thus, by a cool observer, scenes of thrilling interest in the progress of life may be transcribed and conveyed to posterity,

not as they seem to the imagination of the poet or the painter, but as they actually are.

Nothing indeed but close application to discover all the principles of the Daguerrotype,—who indeed can say when they shall *all* be discovered,—is necessary to its universal use in examining, analyzing, modifying, and applying to the benefit of society, that most universal of all the agents which God has given for the beauty and advantage of his creation.

Were there uncertainty in its operation, we should esteem the value of this new instrument at a very much lower rate, but such is not the case. The objects themselves are, in one sense, their own delineators, and perfect accuracy and truth,—strange that we should have to say so of anything earthly—are necessitated. It has indeed been observed by an acute philosopher, that it is no improbability that we may obtain an accurate chart of the lunar world by the moon herself. It says nothing to object to all this, that the action of the Daguerrotype is at present incomplete, for the faculty of accomplishing all is evidently there, and it requires only the skill of mental power to develop it.

A very short time suffices to make an intelligent person, altogether ignorant of the instrument, well acquainted with its nature and use; and, after but few trials, any one must suceed in obtaining perfect specimens of art. M. Arago, for instance, one of the reporters on the Commission of Inquiry to the French Chamber of Legislature, after he had been made acquainted with the process, executed a beautiful piece on his very first attempt.

The very high price at which the instruments have been sold in Paris has prevented the art from progressing in the way that the well-wishers of science could desire. But this is an evil which time will surely rectify, and very shortly it may be confidently anticipated that an efficient instrument may be obtained for the expenditure of 10*l.* or 12*l.* and even less.

The more generally the science is diffused and practised, the more useful must it become, and it is hoped that this article will be in some degree beneficial in promoting both of these desirable objects.

THE DIFFICULTIES OF THE ART.

To those unacquainted with Daguerreotype manipulation, and who merely see that part of the process termed "submitting the plate to the action of light," the only part within the observation of the public, the idea has obtained that it is very simple and easy. In a measure, such is the case. Any one can be a Daguerreotypist, but it may readily be perceived what *kind* of Daguerreotypists *some* make, by the specimens constantly exhibited before our eyes.

As in every profession, certain requisites are necessary, and we know of nothing among them all so much so, next to talent, as patience. So many little and great causes for vexation arises during the manipulation, that it requires a very large stock of patience and perseverance to overcome them with sufficient success to please the multitude of tastes brought to this feast of shadows.

Many, if not all, of the impediments to the success of the artist, are attributed by him to the bad quality of his plates. Now, we propose to show pretty conclusively, that, in a large majority of these cases, the fault lies more with the operator himself than in the plate. What are the complaints? These — the plate is frequently covered with little black specks; the silver is sometimes so thin that the copper shows through; small holes cover the plate, and also, mercury spots appear; and, lastly, they are badly scratched.

As to the two last items, we will answer them very briefly. The operator is too lazy to burn the mercury spots out, or to destroy the scratches by a thorough clean-

ing. We do not say that this can always be done—for if operators will buy plates at a far less price than it is possible to make them good, he must bear the consequences —but in ninety-nine cases out of a hundred it can be.

In a great many instances, the appearance of copper through the silver is imaginative, as we shall illustrate in the course of this article—as well as the other points assumed—by anecdotes which have fallen under our observation.

In the manufacture of Daguerreotype plates, the greatest care is obliged to be observed, otherwise the manufacturer's loss will amount to more than he can possibly gain by chicanery; and in France, where we obtain the most of those used in this country, he is too closely watched by the Government assayers to cheat on a very extensive scale. The thinness of the silver on plates sold as 40ths, can only be accounted for by the *fact*, that large quantities are imported for designing men, and stamped in this country, when there is actually not a 60th part silver on them. The French manufacturer dare not stamp them more than they actually contain, as the laws of France are very strict, and the first detection would send him to prison.

The process of manufacturing plates is such, that it is scarcely possible for the silver to become unevenly spread over its surface; and as it has to pass through the Government assayer's hands before it is made up, it is no more possible to be impure.

The process is substantially this: a piece of copper of a certain weight is taken; one surface polished, and a piece of silver of the same size in length and breadth, but of 1-60th or 40th its weight, is cemented to it; it is then placed in an oven, heated to a certain number of degrees, and submitted to the process of "sweating down." In this operation, it must be watched very closely, as but a few seconds too long or too short would ruin it. It is then taken out, and hammered with large trip-hammers, or rolled into the form in which we receive it. The surface, therefore, must necessarily be even. How, then, account for the large copper spots, which so often perplex the operator? It is readily done by stating the fact, that in rolling or hammering scales of copper occasionally fly off from the edges of the plates, and are carried to its surface, and impressed upon it These can be removed by a little extra rubbing, and should never be in the way of a good artist.

We were once present when two pictures, defaced by these spots, were presented as a complaint against the dealer who sold them, and as the plates did not appear to have been submitted to very laborious cleaning, two others, containing precisely similar spots, but more of them, were submitted to a good operator, and came out of his hands beautifully clear, and perfectly free from any kind of spot whatever.

Against the small copper *holes* in the plates, the artist has more reasonable cause of complaint; but they may be removed by galvanizing; and as they occur less frequently than the other imperfections, should be borne with more patience. And in this connection we would beg leave to say, that we think the dealer too often comes in for a share of censure, when he is really not to blame. So far as our acquaintance goes, we are prepared to assert, that there is not a more honorable class of men in the United States than the dealers in Daguerreotype stock;—there may be exceptions, but we are unacquainted with them. In the matter of plates, particularly, we know that every exertion is made to meet the views and wants of operators, and we believe that, with few exceptions, principally with importers not directly in the trade, no fault is theirs.

The copper holes alluded to, we think, are the only just cause of complaint and annoyance with which the operator has to contend. These may be the result of two causes. First, a want of caution in hammering or rolling the plate, by which inattention, particles of dust are suffered to collect on the surface, and are pressed into the plate; these drop off during handling or transportation, and leave the inequalities. Secondly, by some corrosive substance that adheres to it after rolling, which eats through the silver. We have frequently found small particles on the plate that resembled a metallic oxide, upon removing which a copper hole would appear. They are not the particles of dust above mentioned, for we have examined both attentively through a magnifying glass, and while one presents a light, sandy, crumbling

nature, the other is black and hard. Whatever may be the cause producing these holes, we are fearful that operators will have to submit to them patiently, unless they are willing to pay a price for their plates commensurate with the extra expense required to make them perfect. Some of our artists may be astonished to learn that the plates used by English operators generally, are about four times as heavy as those used in this country, for which they pay three dollars a dozen for the medium size.

We have begun at the lowest step in your ladder of grievances, with regard to plates, and have worked up until we now come to the first mentioned and most universal complaint—those hideous bugbears, —the small black spots, which we so very, very often hear of, appearing during or after the process of gilding. These, we shall ever insist, are the result of some foreign cause; —their very nature prohibiting the idea of their being in the plate, as does also their time of appearing. There is no principle in the process of gilding that can produce the effect. The composition of gilding possesses no quality apart from the other chemicals which may tend to develop any imperfection of the plate. Two of its ingredients — chlorine, and hyposulphite of soda, have already been used in coating or in fixing the picture, and if they had possessed the property of developing these so-called imperfections of the plate, they would be exposed before it were gilded. So far as we know at present, gold has no chemical property. We must, therefore, look for other causes productive of this infinite source of vexation; and we think we can remove it out of the way of our operators—at least in a large majority of cases—and we know that, in this republican country, the majority always carry the day.

During several conversations we have had with various operators on this subject, they have insisted, that the fault must lie in the plate, inasmuch as they had frequently changed their gilding and hyposulphite solutions, and still the spots would appear.

Now, we do not pretend to assert, that, in every instance they are mistaken; for we know that there are instances where slight inequalities in the plate become filled with particles of rotten-stone or rouge during the process of cleaning, which are brought out visibly when finishing the picture. To avoid these, the galvanic battery should be used, and no good operator should be without one; it is a very small additional expense, which saves in trouble and vexation ten times its first cost. We know that many of our artists think they should be furnished with plates at all times that would preclude the necessity of using the battery; but they are very unjust in this particular; for this very evil, being the effect of causes quite beyond the control of either the vender or maker, is unavoidable.

The principal cause, however, of these black spots, is impure water, and particles of dust flying about the room and settling upon the plate in the camera box, or while coating or mercurializing. This we are prepared to assert from actual observation and experiment.

All water, unless distilled, no matter from what source it has been obtained, contains various foreign substances, of different degrees of density, that no system of filtration will entirely remove. One of them, — and the most universal, —is lime, which we know *will* produce black spots if suffered to get on the plate at any time during the manipulation after cleaning. The sulphates of lime, iron, copper, manganese, and other minerals, which we also know will produce these spots, are more or less prevalent in water. There are, also, various vegetable and animal matters dissolved by it, and become so minutely disseminated, that it is impossible to remove them by any other means than distillation. Even after being distilled, unless kept securely covered, water will collect some of these ingredients from the surrounding atmosphere.

As an instance of the difficulties arising from impure water, we will relate two anecdotes, which must convince our artists of the folly of attributing these black spots, in all cases, to the plates. An operator in this city complained frequently of his plates being covered with these spots after gilding, having previously every appearance of being perfect. To our suggestions of impure water being the cause, he answered that it was impossible, as he had taken every precaution to prevent such consequences. He was, however, at last induced to make another trial, with the

same plates, after *thoroughly cleaning* his water-pail and changing his solutions, using in every other respect the same materials; and the result was, entire freedom from like troubles up to the present day, and a complete conviction in his mind of the truth of our reasoning. He found, on examination, that his water-pail became coated in a few hours, with a slimy film, which, upon experiment, he found to produce the very spots of which he complained.

Another operator informed us, that, in the course of his travels, he found it impossible to use the water at one of the towns in his route, it was so filled with mineral substances; and that, in order to get pictures, he was obliged to send sixty miles for softer water. We could multiply instances of this kind, but think these two should be sufficient for our purpose.

The question may arise, how obviate the difficulty? We answer, as we always have done—notwithstanding we have often been laughed at by those who are too conceited ever to improve upon the suggestions of others—distil your water, and, after distillation, keep it secured in close vessels.

Although distilling does not render water *perfectly pure*, it is sufficiently so for our purpose. Water that becomes putrid from standing, most assuredly is not.

As we observed before, lime, or its carbonate, is more or less present in all water. This, and all other mineral, vegetable, and animal matter, is precipitated by boiling; the pure water, in the form of gas, is driven off, and may be collected in a condenser.

The peculiar impurities of different waters may be detected by submission to the following test.

If litmus, or syrup of violets is *reddened* by being put into water, it indicates the presence of an *acid;* and an *alkali* is sure to exist where *turmeric* turns *brown.*

Sulphate, or carbonate of lime, is precipitated by *chloride of barium*, or *oxalate of ammonia.*

Muriates occasion a white, cloudy appearance in water when the *nitrate* of *silver* is added, and water containing iron is blackened by an *infusion of galls.*

If we dissolve soap in alcohol and put a little into water, it will mix readily and perfectly if the water be pure; but if it contains any of the carbonates, sulphates, or muriates, it will curdle, and be precipitated.

There are several other tests, but these are quite sufficient, and most accessible.—If the artist finds it quite impossible to distill his water, he should use rain water only, well filtered and clarified; yet we think no operator should be without the still,—described in our "History and Practice of the Art of Photography,"—or something similar. We are convinced that a very large saving in plates, as well as vexation and trouble would be the result.

Water may be purified by one ounce of alum to the hogshead of the liquid, yet not sufficient for Daguerreotype manipulation.

Another cause of these black specks, is various minute particles of mineral, vegetable and animal matters, which are constantly flying about in the air, and penetrate everywhere. No precautions will entirely exclude them from any space, where it is possible for wind to enter.—Most of these particles have their color changed by heat, and it would be strange indeed, if, with the want of care observed by most artists in keeping operating rooms entirely free from objects that collect dust, and which, by the least agitation, set it in motion, they did not occasionally find their way to the surface of the plate and mar the picture. Dust settling in the camera box has been known to produce this effect, and constructed as the box now in general use is, it is difficult always to prevent it. We, however, think we have invented a box—which we shall describe in a future number—which will remove the operators difficulty in this respect.

One fact which came under our observation a short time since, we will here relate, as it is a good illustration of the above facts. A friend who had been using a new brand of plates for several weeks, and which he pronounced the best he had ever used—suddenly discovered that they were covered with black spots after gilding. As a matter of course—to his mind—the plates were imperfect and not to be compared with first samples—and here we would remark, en parenthesis, that they all came out of the same box and were manufactured at the same time—Others

of different brands were procured and tried, but the same imperfections likewise appeared on them, and not being sufficiently read in the sciences he was totally at a loss to account for the cause, or take measures to prevent them. At this time the carpenters and masons were busily at work making alterations in a portion of the building, and we suggested the probability that the small particles of lime set in motion by tearing down the walls penetrated into his operating room, settled upon the plate, and, in combination with the other chemicals became blackened by the heat of the lamp. This he would not acknowledge, but continued to abuse the plates until the effect disappeared with the workmen.

Another instance of the production of these spots by external causes must suffice, as we have already extended our article on this particular subject, much beyond what we at first anticipated.

An artist opened a gallery in this city and for the first three or four months succeeded very well, both in quality and quantity, with his pictures; but unfortunately for him a hatter took possession of an adjoining room for the purpose of whipping out his furs, the dust from which caused such commotion among the operator's chemicals, and covered every thing about his room so completely, that he was unable to get a picture at all, and was obliged to abandon the premises.

These are facts that must strike every intelligent and reflective operator's mind, and cause him to study more intently the various phases of his profession.

Another source of grieviance to our artists is the variableness of light. This is a point many of us are still too ready to dispute, but they must arrive at the conviction, sooner or later, unless they wish to be left far behind in their art by others of more enquiring and studious minds. We have dwelt at some length on this subject in our "History and Practice of the Art of Photography," and as it is more minutely investigated by Mr. Hunt in his "Researches,"—the first chapter of which we give in our present number, we shall confine ourselves to a few observations and suggestions.

We all know with what variable success the photographic manipulation is pursued even during a single day, be it a day of sunshine or clouds; in fact, we know of instances where operators have pettishly thrown down their plates, locked up their rooms and left, convinced that it was impossible to procure good pictures at that time; and yet when we have asked them the reason, they were either unable to give any, or attributed their want of success to some peculiar state of their chemicals, which they did not know how to remedy.

It is a well ascertained fact that this difficulty *is* the result of the state of the atmosphere, and is always the result of its being in a greater or less degree of a yellow color. The rays of light are now divided by scientific Photographers into photographic and non-photographic, the blue rays being most favorable to photographic manipulation, indigo the next, violet next, and yellow not at all; but on the contrary destroying the effect entirely,* as is found to be the case in Yucatan where these yellow rays are constantly present to the exclusion of all others. We have, then, to consider the means for removing this difficulty. It is very simple. It has been discovered by experiment both by Mr. Claudet of London and Mr. Brady of New York, that blue glass has the power of separating the photographic from the non-photographic rays, without effecting the time of the camera, or the boldness and sharpness of the picture—establishing a principle we laid down three years ago, that it is not so much the strength of light as the kind to which we are to look for perfect and unvarying success.

This being the case, all we have to do, is to admit the light into our operating rooms through a blue medium, by making our windows or sky-lights of glass tinged with that color; and we expect to see the day when not a permanent gallery in this country will be without them. The only glass suitable for this purpose is manufactured in Hungary. Two of our most celebrated Daguerreotypists have already ordered sufficient for large sky-lights, and we do most sincerely hope that others will follow their wise example.

Those who cannot obtain the Hungarian glass may use the blue tissue paper, but

* See History and Practice of the Art of Photography.

the result will not be so favorable on account of paper being less transparent.—The construction of the sky and side light should be more a matter of close study.—A small error in this respect might be the source of much annoyance. It should be so arranged that light can he easily and evenly diffused throughout the room. From a pleasant article in Dicken's "Household Words" we extract the following paragraph which will undoubtedly be new and curious to some of our readers, and is not inappropriate to our theme.

"Who would suppose that absolute darkness may be derived from two rays of light. Yet such is the fact. If two rays of light proceed from two luminous points very close to each other, and are so directed as to cross at a given point on a sheet of white paper in a dark room, their united light will be twice as bright as either ray singly would produce. But if the difference in the distance of the two points be diminished only one half, the one light will extinguish the other, and produce absolute darkness."

The motion of light is subject to the same laws that regulate that of other bodies and hence the necessity of admitting it into the operating room in such a manner that no two rays may become antagonistic and work at cross purposes.

The refraction of light is sometimes a source of annoyance, and is generally caused by imperfect lenses; hence the necessity of a close examination of the camera.—Reject all that are not perfectly clear, or contain the slightest wavy appearance.

We will pursue this subject in a future number.

M. B. BRADY AND THE PHOTOGRAPHIC ART.

BY C. EDWARDS LESTER.

THE DAGUERREOTYPE has now assumed a permanent position among the arts of taste and utility. What was but twelve years ago, regarded as an accidental discovery, which excited the surprise and admiration of mankind, has since been brought, by various stages of progress, to a degree of perfection, which numbers it among the exquisite embellishments of life. It is well known to many of our readers, and they may all adopt it as an assertion which will no longer be disputed, that the Art has been elevated to a higher point in this country, than in the land of its discovery. And, although it is claimed by Daguerre himself, and his disciples on the Continent, that the superiority of our pictures is to be attributed more to the brilliancy of our atmosphere, than to our mechanical and artistic genius; yet, we are compelled to meet the assumption by an argument which cannot be answered, namely, that our own artists in Europe, carrying with them the recent inventions and improvements in the Daguerrean art, made on this side of the Atlantic, have been able to distance all competition, when they have had occasion to test their cleverness, with the artists of the Old World.

In the progress of this Journal, which has been established mainly for the purpose of tracing the development of the Daguerrean Art in this country, we shall have frequent occasions to make honorable mention of those men who have, from time to time, contributed to its progress. We shall begin at the fountain-head, and open our first records, with some account of the eminent artist who stands at the head of this column, and whose portrait we have had engraved for our first embellishment.

Matthew B. Brady, who is now about thirty years of age, has devoted his life chiefly to the cultivation of the arts of taste and design. During his early life, he became extremely attached to Mr. William Page, the celebrated painter, who is now on a visit to Italy; and during his frequent visits to the studio of the painter, received many ideas of art, and tokens of esteem from him, with a number of drawings, which he still preserves as mementos of his friend, and of his own youthful admiration for art.

When the announcement was made in

this country, in 1839, that the wonderful discovery of Daguerre had been made; Mr. Brady felt a deep interest in it, and embraced the first opportunities which lay in his power, of acquiring a knowledge on the subject. Although there was, at the time, considerable incredulity in the United States, and it was generally doubted if the alleged discovery of Daguerre could be brought to perfection, and be numbered among the useful arts, yet the fact that the announcement had been made had excited an interest in the mind of the subject of this sketch, which has increased till the present time. His belief in the genuineness and utility of the discovery, was confirmed by the interest which was manifested in it by such men as Professors Draper, Morse, Chilton, Avery, and many others, who, being well known for their scientific attainments, were not likely to be betrayed by a pretended art, which was not based upon principles of science and of nature.

Availing himself of the first chance that came to hand, he got possession of a Daguerrean apparatus, and began experiments. Gifted with a warm, intuitive perception in such matters, and having already had a good deal of practical experience in mechanical and artistic experiments, he at once undertook a series of them for himself, which resulted so satisfactorily, that he resolved to adopt the art as his profession for life. He carried to the business a resolution which augured the success to which his subsequent and untiring exertions so fully entitled him. It has generally held true that those men who have risen to any considerable degree of eminence, in any calling or profession, have merited and acquired it, chiefly as the reward of long, resolute, and patient labors.

So far as the Daguerreotype art is concerned, we are not aware that any man has devoted himself to it with so much earnestness, or expended upon its development so much time and expense, as Mr. Brady. He has merited the eminence he has acquired; for, from the time he first began to devote himself to it, he has adhered to his early purpose with the firmest resolution, and the most unyielding tenacity. When Daguerreotypes were introduced into the United States, although many improvements were made within a short period, yet, by the public generally, they were regarded only as the results of a mechanical process, by which forms and impressions were left upon the plate, in which likenesses could be traced. They were satisfactory chiefly to persons of crude and uncultivated taste. In a word, they were destitute of every combination of what is usually understood by the word art, in connection with design. They were unsatisfactory in almost all respects, and artists of genius and reputation were, with few exceptions, unwilling to engage in the process. But Mr. Brady resolved to bring the Daguerreotype to perfection, and remove the prejudices which existed against it, by elevating it into the dignity and beauty of an art of taste.

Availing himself of everything that was published and known on the subject at the time, and seizing hold of every new discovery and improvement, he multiplied his facilities to such an extent, that he was soon able to produce pictures that were regarded as quite equal, if not superior, to all that had been made before. His first public exhibition was at the annual Fair of the American Institute, in 1844; and even at that early period, with many rivals in the field, he acquired the reputation of being one of the first artists in the country, and received a premium. Encouraged by his success, he made new efforts, which resulted in important improvements. While he offered inducements to the best operators and chemists to enter his studio, he superintended every process himself, and made himself master of every department of the art, sparing no pains or expense by which new effects could be introduced to increase the facilities or embellishments of the art. We do not know who was the first Daguerrean artist to introduce the sky-light, but Mr. Brady was among the first, and probably derived more immediate and decided advantages from it than any other man. There are several large sky-lights in his studio.

We might remark here, that the subject of light is the grand mystery into which the whole art of Daguerre resolves itself. Indeed it has now, by a long series of inventions and improvements, of which the original inventor never dreamed in the beginning, so changed its character, that it is fast assuming another name. Although it will forever shed lustre upon the name of Daguerre, it will soon be known in every

part of the world, chiefly by the more euphonious title of Photography, which may be interpreted, *The Art of Light*. In the scale of advancement, many of the grades of progress have been regulated by chemical processes; but they all contemplated the action of light, and in the distribution of this subtle element, and the regulation of its force, the chiefest experiments have depended for their success. A vast amount of time and money has been expended in attempting to guide and control the action of light, but it has been to no purpose, and experiments have been rewarded by startling and beautiful discoveries, only when they have carried out the single idea, that, to bring the Daguerrean art to perfection, it was only necessary so to prepare the plate and screens, and regulate the lenses, in correspondence with the laws of light, that the invisible hand of Nature herself might, with her own cunning pencil, by her silent and mysterious operations, trace the forms of creation in all their delicacy, witchery, and power. More than any other of the arts of taste and design, here the work is done by Nature herself. With the painter, everything depends upon the genius that guides the hand. In Photography, everything depends upon the skill with which the elements are prepared to make way for the hand of Nature. And although in the ceaseless repetition of the Photographic process it might seem that the charm of the experiment would be lost in the monotony of its repetition, yet it has often occurred to us that none but a man of sensitiveness and of genius would ever have made the remark which Mr. Brady has so frequently expressed, that he has never, after upwards of twenty thousand experiments, grown so familiar with the process of Daguerreotyping, as not to feel a new and tremulous interest in every repeated result, when, after preparing his plate, he stepped aside to wait in silence for Nature to do her work. There is nothing in the whole field of art or nature so impressive to a refined fancy or a sensitive spirit, as to watch and wait, with veneration and hope, to see how the eternal laws of nature shall recognize in our new experiments, some progress in that wisdom which will never grow into perfection, since nature, in her ingenuity, forever eludes and surpasses the genius of man.

We believe that, from the beginning, Mr. Brady's sky-lights have been so perfectly arranged, that his great success in the new experiments he has undertaken, can be attributed in no small degree to this circumstance. He has now reached such a stage in the art, that it seems to make little difference with him what the state of the atmosphere or light may be, since his lenses are so powerful, his camera obscuras are so numerous and varied, and the light shed upon the picture seems to be so entirely under his control, some of his finest pictures that we have seen, have been taken in the darkest and stormiest days.

In the early part of 1845, he formed the project of collecting all the portraits of distinguished individuals he could induce to sit for that purpose, with the intention, if his life was spared, of making in the end a more complete collection than had ever before been made, of the distinguished men of the nation. In 1845, he exhibited his pictures again before the American Institute, and received one of the first prizes for the best plain and colored Daguerreotypes. Artists of every description now generally awarded to him a high position, and the most distinguished and discriminating of the journals of New York complimented him in the warmest terms on his superior skill and taste. In 1846, he again went to the annual exhibition of the Institute, with new specimens of his art, and, contending with competitors from Boston, Philadelphia, Albany, New York, and other cities, he gained the highest prize.

Having now accomplished, in this respect, the highest of his ambition, he devoted himself with more earnestness to the carrying out of his favorite project, viz., to augment the number of his national collection, and embellish it with still rarer and choicer portraits. He visited the seat of Government, and opened a branch of his establishment there, where he was treated with courtesy and attention by the most distinguished men. We believe he is the only Daguerreotypist in America who has been honored by a visit at his studio from the President, and his Cabinet. Mr. Polk, and all the heads of departments; General Taylor and his Cabinet, with the new President and most of his Cabinet, have given him sittings at his Gallery, and at the President's mansion. In 1849, he brought

out his large picture of General Taylor and his Cabinet, which won for Mr. Brady no little honor; since it was the first work of the kind published in this country. With a branch of his studio in Washington, he has obtained the portrait of almost every man of distinction among our countrymen, and those of ambassadors and celebrated men from foreign nations. Senators, Members of the House of Representatives, Judges of the Supreme Court, distinguished diplomatists and visitors, with the most distinguished men of the army, of the navy, and the learned and liberal professions of every description, with those of the President's Lady, and other distinguished women, now adorn his collection.

In the year 1849, he made his last exhibition before the Institute, and his pictures were regarded as so far superior to all others, that there was awarded to him the first and only gold medal ever given to Daguerreotypes in this country.

The mere enumeration of the distinguished names which adorn his collection would occupy a larger space than we can devote even to the purpose of this sketch. Among them, however, we will enumerate General Jackson, John Quincy Adams, Mr. Tyler, Mr. Van Buren, Mr. Polk, Gen. Taylor, Mr. Fillmore, with every member, we believe, of their Cabinets, Webster, Clay, Calhoun, Benton, Cass, Foote, Fremont, Dickinson, and every member of the U. S. Senate, for a considerable number of years past; all the Judges of the Supreme Court, most of the members of the lower House of Congress, nearly all the foreign ambassadors, the generals of the army, the commodores of the navy, the governors of states, and nearly all those men who have acquired influence in the departments of literature, science, and public life. We should be glad to specify, if we could, some of these portraits, upon which we have looked with the deepest interest, and we should instance among them those of the venerable Mrs. Alexander Hamilton, Mrs. Madison, Mrs. Polk, &c.; but those we should speak of more particularly, are, J. C. Calhoun and General Taylor. These, with others which have been engraved for the *Gallery of Illustrious Americans*, are not only superior to all that ever have been taken in this country by other artists, but they are probably the best which Mr. Brady has taken himself. The one of Mr. Calhoun was the last ever taken of that illustrious Senator. So perfect was it regarded by the family, that several copies of it have been made at their request, as also in the case of General Taylor, of whom the same remark may be made.

This gives us an occasion to speak of the most magnificent publication which has ever been brought out in this country, and which has seldom been equalled, and never surpassed, in the Old World; for Mr. Brady is one of the proprietors of the *Gallery of Illustrious Americans.* This great work was regarded in the beginning as an enterprize too formidable to excite the interest of any American publisher, and in the successful accomplishment of it more genius and exertion have been called into requisition than have ever been displayed in any other American work. It has given to Mr. Brady, as an artist in the Daguerreotype, a reputation which belongs to no other man. There had been National Galleries undertaken before this, but they had either failed for lack of encouragement, or been abandoned mid-way in their progress; or if completed, the portraits themselves had been copied from unsatisfactory paintings, in which few traces could be discovered of resemblance to their originals. Hence the mere announcement that another National Gallery was begun, failed to excite that interest which was soon after manifested in that enterprize. We would not wish to be understood as using unkind or ungenerous language towards those men who attempted to furnish the nation with works of this class; for, before the Daguerrean art was discovered, it is all useless to say that it was within the power of any publisher in the world, or any artist in the world, to execute such faithful, life-like, and strikingly beautiful portraits of our public men. At best, the engravings had to be made from drawings and portraits, executed for the most part by artists of no great talent, and where the original paintings were, as a rule, so unsatisfactory, it could not be supposed that engravers, who had generally never seen the subjects of the painting, could be expected to trace the likenesses with much facility, much less to infuse into their transfers the vital energy and living truth which are so conspicuous in works that are produced in our times.

It will not be disputed that such a work as the *Gallery of Illustrious Americans* could not have been made before the art of Daguerre was discovered. Who, for instance, could measure the value of a collection of faithful Daguerreotypes, if they were only in existence, of the Fathers of the Republic. True, Stuart, Trumbull, and other celebrated portrait painters, did their best to transmit to us the forms of those venerable founders of our empire, and in some instances they were undoubtedly fortunate or skillful enough to seize with some degree of accuracy upon the features, and in a few cases probably, to transmit to us the prevailing expression of the countenance, but we have, after all, no idea, with all the services these artists rendered to the nation by their labors, that we are at this period familiar with the habitual characteristic expression worn in the cabinet, in the field, and around the fire-side, by the patriarchs of the Revolution.

We would not depreciate any of the arts, and least of all the art of painting to which the world was indebted almost exclusively, for a knowledge of the faces and the forms of great men until the time of Daguerre; but we do rejoice that in our age, facilities exist by this new art, which will make posterity as familiar with the faces and forms of distinguished men, as are their own contemporaries.

The first part of the Gallery of Illustrious Americans being now complete, and embracing as it does the portraits and biographical sketces of twelve of our most illustrious citizens, may well afford occasion for these brief remarks in reference to the artist to whom the world is indebted for these remarkable portraits from which they have been engraved. There is about them a naturalness of flesh tint, and the extreme fidelity with which the prevailing expression of the face and the distinguishing hue of the complexion are brought out. In Mr. Calhoun's portrait, for instance, we find a nearer counterpart to that great man's countenance than almost any thing we ever saw, either in oil, or in Daguerreotype. There is depth, and earnestness, and intensity, and spiritualism, which so eminently distinguish him from almost all other men, and which drew from the most critical of our journals the expression that "his face looked more like that of a seer than of an ordinary man." But these remarks are applicable to all the other portraits which have been engraved for the Gallery of Illustrious Americans. In no one instance out of the twelve portraits, can we conceive it possible that the likenesses could be improved. They were all taken expressly for this Gallery, and in doing it Mr. Brady brought out the fullest capacity of the Daguerrean art. So perfect have these likenesses been regarded, that there have been requests proffered from families, from societies, from publishers and engravers, and even from the committees of both Houses of Congress, as in the case of General Taylor, for permission to copy them in getting up memorials of those distinguished men after their death.

Before closing this brief sketch, however, we should remark that Mr. Brady's last improvement in the Photogenic art has been the production of minatures on ivory, which combine all the truthfulness and extreme fidelity of the finished Daguerreotype with the exquisite coloring of the finest miniatures. It is a progressive art, and we believe that Mr. Brady himself still regards it, with all these improvements, only in its infancy. We may adopt this idea and say that we too believe it, because we are told so by the artist himself; but those of our readers who will visit Mr. Brady's Gallery, and look upon those oil colored Daguerrean miniatures, will probably find as much difficulty as we do ourselves in imagining a higher degree of perfection to which the art will ever be carried.

CHLORINE AND ITS COMPOUNDS.

As Photographic artists may derive some benefit from a thorough knowledge of the chemicals used in their art we shall give a description and analysis of each with some of its compounds.

Chlorine gas when pure has a greenish yellow color, is a simple combustible body, possessing a very disagreeable odor and acid taste. It is a non-supporter of combustion and respiration, and has the specific gravity 2·5; 100 cubic inches weigh 76·25 grains; by weight its equivalent is 36,* by volume one measure. By a pressure of four atmospheres,† and by cold produced by the evaporation of sulphurous acid, chlorine gas assumes the appearance of a transparent yellow colored fluid.—Moist chlorine gas assumes the crystalline form when exposed to a temperature of 32° F. The crystals have a yellow color, and are composed of one equivalent of chlorine =36 and ten of water (9x10=90.

Chlorine is prepared by mixing in a glass retort muriatic acid and peroxide of manganese, in the proportions of seventy-four parts of the acid, to forty-four of manganese. By the application of heat, half the muriatic acid is decomposed and the peroxide of manganese gives off one equivalent, or eight parts of oxygen. The hydrogen of the muriatic acid unites with the extricated oxygen, forming an equivalent, of water. The chlorine being liberated, may be collected over hot water. The remainder of the muriatic acid unites with the protoxide of manganese, and forms a salt, which remains in the retort.

Chlorine may also be prepared by mixing together, in a glass retort, eighty parts of sulphuric acid, forty-four parts peroxide of manganese, and sixty parts of chloride of soduim. In this instance, eight parts of oxygen of the peroxide of manganese unite with the sodium, forming soda, with which forty parts of the sulphuric acid combine and form the sulphate of soda; chlorine gas being liberated may be collected as before. The remaining forty parts of acid then combine with the thirty-six parts of protoxide of manganese to make the sulphate of manganese.

At the temperature of 68°, water absorbs one and a half times its volume of the gas, and the solution is named liquid or aqueous chlorine. This aqueous chlorine has no acid properties, but is by exposure to the light (part of the water being decomposed) converted into muriatic acid.

Chlorine has the property of destroying effluvia arising from the putrefaction of animal and vegetable matters; it is consequently employed in the process of bleaching, and in the decomposition of effluvia arising from contageous diseases. It must be observed, however, that *perfectly* dry chlorine does not effect vegetable coloring matters. It appears, then, that the destruction of the color depends upon the chlorine decomposing the water, uniting with the hydrogen, and giving off the oxygen, which deprives the substance of its color.

Arsenic, antimony and copper, in very fine powder, when thrown into jars containing this gas, immediately take fire. Mercury if previously heated and then introduced into chlorine, will also unite with the phenomena of burning. If a lighted taper be put into chlorine the flame will diminish, burn with a red flame, depositing a large quantity of carbon.

Chlorine may be detected by the dense white curdy precipitate it forms with nitrate of silver; a precipitate soluble in

* All bodies which unite chemically tend to combine in certain fixed or definite proportions.—The numbers representing these properties are called *chemical equivalents*. Thus, one pound of hydrogen combines with eight pounds of oxygen; 1 therefore, is the chemical equivalent of hydrogen, and 8 that of oxygen. When bodies united in more than one proportion, the proportion in each successive compound is represented by a multiple of that in the first compound as in the following examples.

	Nitrogen.		Oxygen.		
Oxide of Nitrogen,	14·2	x	8	=	22·2
Nitrous Acid,	14·2	x	32	=	46·2
Nitric Acid,	14·2	x	40	=	54·2

The equivalents of compounds are found by adding the equivalents of their elements; thus 22·2 is the equivalent of oxide of nitrogen, consisting of 8 oxygen and 14·2 of nitrogen. *Bain.* In other words 8 parts of oxygen with 14·2-10 of nitrogen.

† Atmospheric pressure is 15 pounds to the square inch.—*Ed.*

ammonia, but insoluble in acids.—*Chemical Pocket Book.*

Chlorine gas when inhaled proves a very irritative poison, the effects from which may be removed by inhaling vapors of warm water, wine, ether or ammonia. If none of these articles be within reach, a speedy removal into the fresh air will gradually produce recovery.

Chlorine is used in the Daguerrean art combined with gold, iodine and bromine; in the first case to whiten or clarify the picture, and in the latter as an accelerator. It is not generally used we believe in dry sensitives, but we should think that a few drops mixed with the lime previous to putting in the bromine would be beneficial.

Clorous Acid, is a combination of chlorine and oxygen. It possesses powerful oxydizing and bleaching properties and unites with the basis forming salts called chlorites.

Chloric Acid, is formed by pouring one part of sulphuric acid and ten of water into a weak solution of chlorate of baryta, so long as a white precipitate is found. It reddens the vegetable blues.

Chloride of Bromine, is made by passing dry chlorine through brome and collecting the disengaged vapor in a receiver surrounded by ice. It is a very good accelerator but there are others much better, of more recent invention.

Chloride of Sodium.—This is the salt of commerce, and is used in the Daguerrean art in the manufacture of chloride of gold and silvering solutions.

Chloride of Calcium, is made by saturating chalk or white marble with dilute muriatic acid; filter, evaporate, and crystalize. It unites with iodine, bromine and fluorine, and may be used in combination with these as a sensitive.

Chloride of Lime, is too well known to need a word of comment here, and owing to its absorbent properties, for water particularly, the use of it is not attempted by Daguerreotypists.

The *chlorides of silver and gold* are both used in the photogenic art, and a description of each will be found under its appropriate head in future numbers of our Journal. However, as the chloride of gold is a very important agent we will here subjoin a receipt for making it. Take three parts nitro-muriatic acid, put it into a cup and drop into it a piece of pure gold one third its weight, and let it evaporate over the flame of your spirit lamp—taking care that it does not get too hot; then set it aside to crystalize. When it is perfectly dry, bottle it.

Chloride of Copper, is made by heating one part of copper filings, with two parts of corrosive sublimate. It is soluble in muriatic acid, and assumes a variety of colors, being sometimes white, sometimes yellow, and at other times brown. It yet may be an agent in procuring colored Daguerreotypes.

ART-UNIONS.

BY J. K. FISHER.

There are now competing for public favor three Art Unions, formed upon different plans, and constructed upon different principles—the American, the Philadelphia, and the New England Art Unions. The plan of the first is, that the managing committee shall select the works to be purchased, and that they shall be drawn for in a lottery, in such a way that mere chance decides as to the destination of each work. That of the second is, that the money disposable for the purchase of works of art shall be divided into sums of such amount as the managers deem best, and that these sums shall be represented by certificates, which will be payable in cash to artists upon their declaration that they have received them in payment for their works. The New England Art Union is upon a plan nearly the same; it allows the drawer

to buy any work of an American artist, or to give a commission for the execution of one.

The London Art Union, whose plan is nearly the same, has been highly successful; and the peculiar feature of the liberty of choice for the drawer is deemed of prominent importance by its directors. But that meddling and mischievous branch of the Government, the Board of Trade, has been trying to force upon it a plan somewhat resembling that of the American Art Union, so far, at least, as the higher prizes are concerned. This dictation the directors resist, declaring that their success has been due to the liberal and wise policy of allowing drawers to suit their own tastes, and that a falling off of contributors had been caused by that attempt of the Board of Trade to force upon them a system repugnant to the feelings of Englishmen.

But while the directors of the London Art Union have been battling for the principle of liberty, those of the American have been securing to themselves the power to domineer over the artists and subscribers, to direct the genius of the former and the taste of the latter, and "*form a new school of art*," on such lofty principles as may be expected in fourth-rate men, who struggle to obtain distinction by doing something extraordinary, without possessing the slightest qualification for such a task, either from nature or from education. That their real taste and principles are, and what is their fitness to direct the affairs of a liberal art, may be inferred from the advertisements they have recently published in several of the principal papers, in which they declare that the prints which each member will this year receive, "to a *certainty*," are worth twenty dollars — four times the amount of the subscription. The entire beauty of this quackery will appear when we say that, last year, (and probably this also,) the cost of the prints was less than a quarter of the subscription; hence the pretence is, that they give the subscribers sixteen times the value of the money devoted to this branch of the business. Now, every business-man knows that the *value* of commodities of this kind can never much exceed the cost of producing and selling them, with a fair profit on the outlay. And if anything can affect the application of this known law of trade to this particular case, it is this, that by an excessive diffusion these prints are made so common and hackneyed, and the plates so worn, and most of the impressions so poor, that most people become tired of them, and so disgusted, that instead of giving twenty dollars, or five dollars, or even a dollar and a quarter — the utmost cost —they would rather be excused from looking at them any more, or hearing more about them. We do not believe that these prints, six months hence, can be sold for the actual cost.

And we are sorry that this is not the only Art Union that brags about its prints; the Philadelphia Art Union advertises that its print is worth the amount of the subscription. We think the print feature of Art Unions is wholly bad. The interest of a print consists very much in its rarity—what you have seen in every house and shop, you do not wish to see in your friend's portfolio.

[In some of the papers, we have recently seen a more simple plan of an Art Union, which we think would be far better than any now in operation. It is simply a lottery for money prizes, to be so conditioned that they cannot be expended for anything but works of art; but with no other restriction. Drawers may buy old pictures or new, foreign or native prints, if they like; or statuetes; or they may order portraits or landscapes, or any other works to be executed.—Ed]

From the London Art-Journal.

PHOTOGRAPHY ON PAPER AND ON GLASS.

BY T. A. MALONE.

It is now more than eleven years since Mr. Fox Talbot announced to the Royal Society that he had succeeded in fixing, by chemical agency, on a sheet of ordinary paper, the forms and lights and shadows of the beautiful images of the camera obscura.

This was good news to the few lovers of the then new art of sun-painting, whose admiration of Daguerre's marvelous landscapes had not been unmixed with regret that a heavy and expensive metallic plate, joined to a delicately constituted and easily destroyed image, should be characteristic of his invention, detracting materially from its usefulness.

The failure of such eminent and practical men as Sir Humphry Davy and Mr. Wedgwood, half a century ago, in their attempts to draw upon paper with pencils of light, rendered the success of Mr. Talbot the more interesting.

In 1840, further improvements took place, by which the image could be produced in a much shorter space of time, and with a greater degree of perfection. A patent for the new discoveries was taken out; and the Talbotype, at this moment, remains the best and most practical of all the photographic methods hitherto proposed.

As is usual with new inventions, many modifications have been introduced in its manipulation, and new mediums proposed for the reception of the chemical substances used. Even the latter themselves have not altogether escaped the ingenuity of the improver.

Mr. Robert Hunt's sulphate of iron is, perhaps, the best of all substitutes for gallic acid. Unfortunately, some differences in its state, or in the qualities of the paper employed, render failures in its use not unfrequent.

A thorough examination of this subject has yet to be made, and would, doubtless, prove very instructive to the chemist and the photographer. We believe the deoxidizing power of the iron salt to be quite as great as that of the recently introduced pyro-gallic acid, and its inexpensiveness gives it the advantage.

The great difficulty experienced in procuring good paper has kept back the Talbotyye from its legitimate position. It is by its merit entitled to take precedence of the Daguerreotype in public estimation; but since interested advocates are justly looked upon with suspicion, this claim, in behalf of the genius of our country, must not rest on our testimony alone. Let us, therefore, refer it to an impartial arbitrator.

The Baron Gros, a gentleman whose labors in diplomacy are just now better known than his "Notes on Photography," speaking of the Daguerreotype, asks—"Is it not easy to foresee that it has almost run its time, and that its rival on paper is destined by incontestible advantages to carry the day against it, (*porte le jour sur elle.*")*

In justice, we must acknowledge that photography on paper has received a great assistance from France. We can almost forgive Mr. Blanquart Evrard his piracy (?) of Mr. Talbot's process, on account of what we have learned about the properties of French paper. It is more sensitive generally, and particularly to rays of feeble intensity, giving the half-tints and foliage of landscapes with a great degree of perfection, insuring a more natural gradation of light and shade, and consequently a more ariel perspective, than is obtained on animal sized English paper. Starch and resinous soap are the peculiar features of French

* This is a question easily asked, and may be answered according to the taste and prepossession of him who answers it. To our mind, the Daguerreotype is still but in its infancy, and the vast improvements daily made, yet to be made, and which will undoubtedly be made, will steadily sustain its present position, at the head of the Photographic art. As perfect as the manipulators of the Talbotype profess to delineate an image on paper, they do not succeed so well as to preclude the necessity of re-touching various parts of the picture with the pencil. All their art and care is incompetent to produce those well-defined, truthful and exquisite lines brought out by the Daguerreotype process; while the more rapid manipulation, and greater economy of the latter will always cause it to be the more preferable.—Ed.

size, and on these vegetable substances its superiority probably depends.

The uncertainty in the manipulation of a paper uniformly homogeneous in texture, out of the varied and impure materials generally used, and by a process, the philosophy of which is so little understood, has led to the devisal of many substances.

Glass plates coated with various liquids capable of leaving an organic film, on drying, have as yet proved most successful.—Albumen is now generally used; it was introduced by M. Niepce de Saint Victor, who published in the *Zechnologiste* for 1848, the method of applying it. In repeating his experiments we have been led to modify his plan, and this not only with success but with the production of a perfectly novel result, an account of which has already appeared in the *Athenaeum.* (June 1, No. 1179). We shall transcribe its substance, adding some particulars which the recent experiments of ourselves and others have furnished.

To the white of an egg its own bulk of water is to be added; the mixture beaten into a froth, is then strained through a piece of linen cloth and preserved for use in a glass stoppered bottle; then a piece of plate glass, cleaned with a solution of caustic potash, or other alkali, is to be washed in water and dried with a cloth.—When the glass is about to be used, breathe on it and rub its surface with clean new blotting paper; then to remove the dust and fibres which remain, use cotton-wool, or a piece of new linen. Unless this latter, and indeed, every other caution is taken to prevent the presence of dust, the picture will be full of spots, produced by a greater absorption of iodine (in a subsequent process), in those than in the surrounding parts.

On the clean glass, pour the albumen, inclining the plate from side to side until it is covered, allow the excess to run off at one end of the corners, keeping the plate inclined but nearly vertical. As soon as the albumen ceases to drop rapidly, breathe on or warm the lower half of the plate; the warmth and moisture of the breath will soon cause it to part with more of its albumen, which has now become more fluid; of course, care must be taken to warm only the lower half. Wiping the edges constantly, hastens the operation.

Until this plan was adopted the coatings were seldom uniform, the upper half of the plate retained less than the lower. When no more albumen runs down, dry the plate by a lamp or by a common fire if the dust that it is inclined to impart can be avoided.

The film, when dry, is quite free from cracks, and is so thin and transparent that the brilliancy of the glass is unimpaired. It is almost necessary to mark it to know which side has been prepared.

The next operation is to iodize the plate. Dilute pure iodine with dry white sand in a mortar, using about equal parts of each. Put this mixture into a square glass vessel, over it place the albumined, plate previously heated to about 100 deg. Fahrn.

As soon as the film has become yellow in color, resembling beautifully stained glass, &c., move the plate into a room lighted only by a candle, or through any yellow transparent substance; yellow calico, for instance; then plunge it vertically and rapidly into a deep narrow vessel containing a solution of aceto-nitrate of silver, made by adding one hundred grains of nitrate of silver to fifty miniums of glacial acetic acid, diluted with five ounces of distilled water. Allow it to remain until the transparent yellow tint disappears, to be succeeded by a milky-looking film of iodide of silver. Washing with distilled water leaves the plate ready for the camera.

It may here be noted that the plate is heated in iodizing, for the purpose of accelerating the absorption of the iodine; an exposure to the vapor for ten minutes, with a few seconds immersion in the silver solution, has been found sufficient.

Hydrochloric acid, chlorine, or bromine, may be used with the iodine, to give increased sensitiveness when making *negatives.* I merely notice this in passing, as it is not quite certain that all those substances conduce to the perfection of the positive image to be presently described.

The albumen of other fibres may be iodized in a shorter space of time by using an alcoholic solution of iodine, which, on evaporation, quickly leaves a good uniform coating. The alcohol must be perfectly free from water.

Returning to the plate, which has just been submitted to the light in the camera, we pour over its surface a saturated solu-

tion of gallic acid. A negative Talbotype image on the albumen is the result. At this point previous experamentalists have stopped. We have gone further, and find that by pouring on the surface of the reddish brown negative image, during its development, a strong solution of nitrate of silver, a remarkable effect is produced. The brown image deepens in intensity until it becomes black. Another change commences—the image begins to grow lighter; and finally, by perfectly natural magic, black is converted into white, presenting the curious phenomenon of the change of a Talbotype *negative* into apparently a positive Daguerreotype; the *positive* still retaining its negative properties when examined by transmitted light.

To fix the picture, a solution of one part of hyposulphite of soda in sixteen parts of water is poured upon the plate and left for several minutes, until the iodide of silver has been dissolved. Washing in water completes the process.

The phenomena of the Daguerrotype is in this case produced by very opposite agency, no mercury being present, metallic silver here producing the light, while in the Daguerrotype it produces the shadows of the picture.

We at first hesitated about assigning a cause for the dull white granular deposit which forms the image, judging it to be due simply to molecular arrangement. Later experiments, however, have given us continuous films of bright metalic silver, and we find the dull deposit becomes brilliant and metalic when burnished.

It should be observed, that the positive image we speak of, is on glass, strictly analogous to the Daguerrotype. It is positive when viewed at any angle but that which enables it to reflect the light of the sky. This is one of its characteristics. It must not be confounded with the continuous film image which is seen properly only at one angle; the angle at which the other ceases to exist.

It is also curious to observe the details of the image, absent, when the plate is viewed negatively by transmitted light, appear when viewed positively by reflected light.

Professor. Wheatstone has suggested the desirableness of substituting blackened wood or blackened ivory for glass plate. We should probably then have the novelty of a Daguerreotype on wood, free from some of the disadvantages attendant on polished metal.

Mr. Cundell suggests its application to wood-block for wood-engravers for certain purposes, making the drawings by light instead of by hand.*

Mr. Talbot views it as the link between Talbotype and Daguerrotype; some appelation referring to its *silver* origin would probably be desirable to avoid confusion when speaking of it.

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* We understand that Mr. Wattles of this city, of whom we have spoken on a former occasion, has invented a process for impressing an image upon "blocks of wood for wood engravers," the result of which has met his most sanguine expectations. We should be pleased to have it communicated for our columns.—*Ed. Pho. Art-Journal.*

THE DAGUERREOTYPE PATENT IN ENGLAND.

As many inquiries have been made of us regarding the patent of Mr. Beard for the exclusive use of the Daguerrotype process in England, we publish the following decision of the Vice-Chancellor of England on the subject. It will be seen that Mr. Beard holds his patent by very slight tenure, which will, in all probability, be set aside when he comes to trial, if he can ever summon courage, and procure the means for sustaining the prosecution, for we have been informed that he is already bankrupt in consequence of his law-suits in the matter.

Beard *v.* Egerton.—*In the Court of Chancery, before the Vice Chancellor of England* (*Sir L. Shadwell*)—*June* 2, 1845.

This case excited considerable interest, from an endeavor of the defendents to overturn the monopoly of the plaintiff on the Daguerrotype, by showing that the invention had been given to the whole world by the bounty of the French nation.

Mr. Bethell (with Mr. Malins and Mr. Grove, of the common Law bar) moved to dissolve an injunction obtained by Mr. Beard, the patentee, restraining the defendants from taking or vending likenesses, selling the apparatus, or teaching the art of taking likenessess by means of the process. The plaintiff represented that he was the owner of the invention by assignment of the original patents granted to one Miles Berry, on the 14th day of August 1839, as the agent for Messrs Daguerre and Neipce, the inventors, and that the defendants were exercising a process which was an infringement of the patent, and possessed only a colorable distinction. The defendant now upon their answer, alleged that the invention had been known to the scientific world for many years, and that except the mercurial process, which was invented by M. Daguerre, it was neither new in principle or practice in the three important features of obtaining images by the agency of light, of the use of the camera obscura to form the representation, or of the action of light on preparations of silver. Experiments connected with these three features were published by Sir H. Davy and M. Wedgewood in the Journals of the Royal Society in 1802. In 1801, Ritler observed the action of the sun's rays on chloride of silver, and published his experiments. Count Rumford also published two papers on "the effect of light on compounds of gold and silver;" and in 1837, J. N. Neipce, a Frenchman, presented a paper to the Royal Society, explanatory of certain pictures he exhibited, which were taken on metallic plates produced by the agency of light. Likewise in the year 1834, Mr. Fox Talbot began to make experiments in fixing images received by the camera obscura, and read a paper in January 1839, to the Royal Society, entitled, "Some account of the art of Photographic drawing, by which natural objects may be made to delineate themselves without the aid of the artist's pencil." In addition to the want of novelty in the invention, it was clear that the French nation had purchased it, and presented it freely to the world of science. On the 15th of July, 1839, a bill was presented to the French chamber by M. Duchatel, by which a pension of 6,000f. per annum was secured to M. Daguerre for his life, and 4,000f. per annum to M. Neipce, with one half in reversion to their respective widows. The Minister in his speech on the introduction of the Bill, made use of the following language to the French chamber:—"You will concur in a sentiment which has already awakened universal sympathy: you will never suffer us to leave to foreign nations the glory of endowing the world (*tout le monde*) of science with one of the most wonderful discoveries that honor our native land."

M. Arago also declared in the chamber, after the passing of the Bill, "This discovery France has adopted; from the first moment she has cherished a pride in liberally bestowing it a gift to the whole world" (*le monde entier.*) The defendants, therefore, submitted that it would be a fraud upon the French nation and the world at large, if a monopoly of the invention could

be subsequently secured by patent in this country by the agent of M. Daguerre. The learned council, however, contended that the process of the defendants was materially different from that used by the plaintiff, and, therefore, that there had been no infringement. The substance of the plaintiff's process was the preparation of a surface of silver plated in copper, by cleansing and polishing, with a view of laying bare the metalic surface. The plate was then exposed to the evaporation arising from the iodine, until the surface of the silver was covered with a golden tinge, which was caused by a thin film of iodine of silver deposited on the plate. The action of light was then introduced on the iodised plate by means of the camera obscura, through which the object was reflected. The plate was next withdrawn from the camera obscura, and submitted to the fumes of mercury, heated to a temperature of sixty degrees centigrade, and the picture was fixed by removing the coating of iodine not covered by the delineation by the application of a solution of sea salt or hyposulphite of soda. The defendants, who were the agents of Lerebour, of Paris, and M. Voightlander, of Vienna, employed for the purpose certain optical apparatus, applied by those persons, among other things, to the daguerreotype, and instead of using iodine, which they represented to be of no use, they substituted a combination of chlorine bromine fluorial. The operation was also performed by the defendant's process in a few minutes, while the plaintiff's required a strong light, and occupied from five minutes to half an hour. The defendants, therefore, insisted the patent could not be sustained on these grounds, and moreover insisted that the plaintiff had lost his right to an injunction by twelve months acquiescence in the defendants' use of the process, which the plaintiff was well aware of when he applied for the injunction.

Mr. Lowndes and *Mr. Torriano* supported the injunction, and said that the language of the contract between the French government and M. Daguerre, was an answer to the main argument of the defendant—that the invention had been purchased by France, and given to the whole world. The contract, in fact, contained no words which indicated a purchase for all mankind, or for the world of science. It was simply a sale to the French government for the use of the French nation for the consideration therein expressed, and because, perhaps, Frenchmen, hyperbolically called France, "the whole world," or some members of that government had used the words "*tout le monde*," or "*le monde entier*," before an enthusiastic chamber in reference to the invention, the plaintiff was not to have taken away those rights which were expressly secured to him at the time of the contract; for an examination of the dates would show that the patent was granted in this country on the 14th of August, and the contract with the French government was purposely delayed till the 19th, in order that the patent might be perfected before the invention was made public in France. The learned counsel then met the other objections to the patent, insisting that there was no substantial difference in the two processes; that though results had been published at different times of experiments similar to the plaintiff's invention, the discovery itself was new, and had never been brought to maturity before the patent was taken out by Mr. Berry.

The Vice Chancellor said, it was not necessary for him now to pronounce an opinion whether the patent was good or bad, *prima facie*, after the number of years it had been enjoyed, and the many injunctions which had been granted by the Court to protect it, there was sufficient ground to say it was so far good that the Court would not lightly permit an infringement. His Honor, however, was of opinion that the terms of the injunction were too large. The patent was only for a particular process by means of the apparatus, by which he understood such things as the camera obscura, and the substances mentioned. The patent was taken out, not for the use of them *simpliciter*, but for the use of them in a particular manner; and, therefore, he thought the injunction could not be continued to restrain the sale of the apparatus. The ground, however, on which he should dissolve the injunction was this: The plaintiff stated when he obtained the injunction that he had no knowledge, or sufficient information of the infringement of his rights till the 21st of February, and no sufficient evidence thereof till the 26th of February. His Honor thought the af-

fidavit, without being false, was so constructed that the party might swear truly without swearing fully to the satisfaction of the Court. The defendants showed that the plaintiff had several interviews with them, in the course of which he was made aware of what was going on twelve months before the application, and though there might not have been an infringement step by step, through the whole process, the plaintiff knew there was very near an infringement. He might not have had sufficient evidence of an infringement, but on such evidence as he had it was his duty on an application that might be considered *exparte* to have communicated all the facts within his knowledge to the Court. For the suppression of this material circumstance, he should, acting on his uniform rule in such cases, dissolve the injunction with costs. As both parties desired to try the question, he should direct an action at law to be brought by the plaintiff, and give him liberty to inspect the defendant's apparatus.—*Lond. Rept., Vol. VI. p.* 256, *N. S.*

KNOWLEDGE OF THE ART.

In a number of instances, where we have tendered the sale of our "History and Practice of the Art of Photography," we have been met by the reply — "We know enough of the art already." What a groveling mind—what an entire want of that noble ambition, which can alone guide a man to eminence, does such an answer indicate. Why, such a man *placed* in the situation of a common scavenger would be content with his position, and would not raise a muscle to better his condition; in truth, he is a carricature of the image of man, and it is truly gratifying to know that, although we have met with them, they are comparatively few. Some of these have left the business in disgust, but not before the public became disgusted with them. A perfect workman is generally a modest man, and, notwithstanding he may evince a pride in hearing his productions praised, and knowing they are properly esteemed, he will not relax his exertions, and say he knows enough of the art; but he will continually push onward, seize every source of information with eagerness, and bend his energies with renewed vigor to attain, if possible, a still higher degree of excellence —not an experiment, or a suggestion, will he leave untried—neither will he turn from an humble fellow-artist when he offers his advice, though he may know him to be more ignorant on some points than himself, for it is often the case that one man may stumble upon a valuable improvement that may entirely escape the research of the more intelligent. He is not content with merely plodding along in the footsteps of his ill-lusterless—excuse the pun—predecessors, but will, each day, endeavor to improve upon his work of the preceeding; and when he has effected all for him possible to accomplish, he will at the closing scene of life declare—with a celebrated pilgrim—that he had not learned one half, but died an ignorant man.

Where would have been our steam navy, if Fulton, when he had learned all the system of engineering his teacher could impart, had been content with his knowledge; or if his followers had declared his labors perfect? Where would any of our arts and sciences be, if the remark, "we know enough already," had been the reply of the savans of the past and present age to those who wished to instruct them?

Perfection is never attained in this world, but we must endeavor to get as near it as possible, and believe us, we never can advance one step towards it if we rely wholly on our own exertions. The thing is an utter impossibility. Man was never born

to isolation—the laws of nature prohibit it—the rights of man prohibit it, and, above all, the will of God prohibits it. Man can only live happily in free intercourse with his fellow man, so far as the worldly transactions of this life tend, and knowledge can only be obtained through the same medium. There are none so foolish as the over-wise, for they stand in their own light and quench the flame of knowledge held up to them, in the same spirit that a man blows out his brains because he is afraid to live. Equally foolish is he who would hoard up his knowledge, as the miser buries his ill-gotten gains, for he knows not how soon the same discoveries may be made by another, and he deprived of the honor.

There is more honor and merit in giving a new discovery or invention—let it be restricted, if you will, by a patent—to the world, than in a selfish appropriation of it to our own use. We believe that every one has an undoubted right to the benefits of whatever he may invent, but we, at the same time, contend that he will derive far greater advantage from it by permitting its use by others, than he can by keeping it entirely to himself. There is no better illustration of this fact, than the Daguerrean art itself. By disposing of it as he did, the great Daguerre won for himself an imperishable name, as well as an independent fortune—and yet it can by no means be said that he perfected the art. It was left to after experimentalists, the principal of whom, we are proud to say, are our own countrymen, to bring it to its present exquisite state. At the same time, who can say that Daguerre was not the great original? Who will dare to endeavor to rob him of his well-earned fame? None but some mean pettifogger, who is not ashamed of the frowns and sneers of his fellow men.

We believe that some valuable and astonishing discovery is yet to be made in this new art—one that will set the whole artistic world in commotion. Who is to be the fortunate discoverer? Certainly not he who "knows enough of the art already." No, it will be he who dips deep into the Pierian spring — who devotes his days to practice and his nights to study — whose very mind and soul is wrapped up in his art. He will pursue it as did the alchemists of old their search after the philosopher's stone, but with more surety of success.

Know enough of the art already! Why, you poor deluded delineator of shadows, you are struggling in a darker slough of ignorance than ever crossed the paths of the earliest philosophers; you are ten times more ignorant than those who think they know nothing. You are like the poverty stricken wretch, who lies in ambush to stab the friend who is on his way to relieve him from his abject misery. You are like the Pharisees, who expected to get to heaven by making long prayers and covering the heart with a mantle of self-righteousness. You "take the shadow before the substance fades," but it is more than probable that the shadow passes away first, and yet you know enough of the art. We pity you from the bottom of our heart, for you must, sooner or later, find your level.

To those who are truly diligent in the pursuit of their profession, and yet find difficulties apparently almost insurmountable, we would offer a few words of encouragement. Be not cast down. The more impregnable the portals appear, the more resolute and persevering should you be in your attacks. Mark well your points of advantage, and strive onward with renewed vigor, and some weak spot must give way beneath your prowess. If you wish a stimulus to your exertion, read the lives of Newton, of Davy, of Fulton, and of other kindred spirits. Follow them through their days and nights of toil and privation, and if your heart does not return to the work with more buoyancy, there is no efficacy in good and bright examples.

You have a vast field of study before you, and it will require the closest application to master it; but nerve your mind to the task, grasp the crumbling fabric ere it falls and you will find the deeper you delve the more easily you may.

MR. FOX TALBOT'S

LATE IMPROVEMENTS IN PHOTOGRAPHY.

MR. FOX TALBOT having published the specifications of his patent for his late "Improvements in Photography," we take the following abstract of them from the London Art Journal, for the benefit of our readers, making a few alterations that they may be more easily referred to:

I. TALBOTYPES ON PORCELAIN. "The first part of the patentee's invention consists in the use of plates of unglazed porcelain, to receive the photographic image.

A plate intended for photographic purposes should be made of the finest materials employed by the manufacturers of porcelain; it should also be flat, very thin, and even transparent; if too thin, so that there would be a chance of breaking, it may be attached by means of a cement to a piece of glass, to give it strength. The substance of the plate should be slightly porous, so as to enable it to imbibe and retain a sufficient quantity of the chemical solutions employed.

To prepare the plate for use, it is first required to give it a coating of albumen, or white of eggs, laid on very evenly, and gently dried at a fire. According as the plate is more or less porous, it requires more or less of the albuminous coating; it is best to employ a very close-grained porcelain, which requires very little white of egg. The prepared plate may be made sensitive to light, in the same way in which a sheet of paper is rendered sensitive, and we generally find the same methods applicable for photographic pictures on paper applicable to those on porcelain plates; and one of the processes employed by the pateentees is nearly the the same as that patented by Mr. Talbot in 1841.

"The prepared plate is dipped into a solution of nitrate of silver, made by dissolving twenty-five grains of nitrate in one ounce of water, or the solution is spread over the plate uniformly with a brush; the plate is then dried, afterwards dipped into a solution of potassium, of the strength of about twenty-five grains of iodide to one ounce of water; again dried, and the surface rubbed clean and smooth with cotton.

"The plate is now of a pale yellow color, owing to the formation on its surface of iodide of silver. The plate prepared as above directed, may be kept in this state until required for use, when it is to be rendered sensitive to light by washing it over with a solution of gallo-nitrate of silver, and then placed in the camera; and the image obtained is to be rendered visible, and sufficiently strengthened by another washing of the same liquid, aided by a gentle warmth. The negative picture thus obtained is fixed by washing it with water, then with bromide of potassium, or what is still better, hyposulphite of soda, and again several times in water.

"The plate of porcelain being semi-transparent, positive pictures can be obtained from the above-mentioned negative ones by copying them in a copying frame.

"The picture obtained on porcelain can be altered or modified in appearance by the application of a strong heat,—a process not applicable to pictures taken on paper.—With respect to this part of the invention, the patentees claim:—The obtaining, by means of the camera or copying-frame, photographic images or pictures upon slabs or plates of porcelain."

II. PHOTOGRAPHS ON GLASS. The second part relates to a process which has been discovered and improved upon by Mr. Malone, (who is associated with Mr. Talbot in the patent,) which will be found in another part of our Journal.

III. A METHOD OF OBTAINING A MORE COMPLETE FIXATION OF PHOTOGRAPHIC PICTURES ON PAPER. For this purpose the print, after undergoing the usual fixing process, is dipped into a boiling solution of strong caustic potash, which changes the tint of the print, and usually, after a certain time, acquires something of a greenish tint, which indicates that the process is terminated. The picture is then well washed and dried, and if the tint acquired by it is not pleasing to the eye, a slight exposure of it to the vapors of sulphuretted hydrogen will restore it to its agreeable brown or sepia tint.

Under this treatment the picture diminishes in size, insomuch that if it were pre-

viously cut in two, and one part submitted to the potash process, and the other not, the two halves, when afterwards put together, would be found not to correspond.

The advantage of this process for removing any iodine which, even after fixing with hyposulphite, remains in the paper, is great, and it will tend much to preserve those beautiful transcripts of Nature.

IV. Varnished Paper as a Substitute for Glass. The patentee then claims as an improvement, the use of varnished paper, or other transparent paper, impervious to water, as a substitute for glass, in certain circumstances, to support a film of albumen for photographic purposes.

A sheet of writing paper is brushed over with several coats of varnish on both sides, it thus becomes extremely transparent. It is then brushed over on one side with albumen, or a mixture of albumen and gelatine, and then dried. This albumen is capable of being rendered sensitive to light by exposing it to the vapor of iodine, and by following the rest of the process indicated in the preceding section of this specification.

The advantages of using varnished or oiled paper does not consist in any superiority of the images over those obtained on glass, but in the greater convenience of using paper than glass in cases where a large number of pictures are to be made and carried about for considerable distances. Besides this, there is a well-known kind of photographic pictures, giving panoramic views of scenery, which are produced on a curved surface, by a movement of the object-glass of the camera To the production of these images glass is hardly applicable, since it cannot be readily bent with the required curve, and again straightened; but the case is met by employing talc, varnished paper, oiled paper, &c., instead of glass.

It will be seen that the varnished paper acts as a support to the film of albumen or gelatine, which is the surface on which the light acts, and forms the picture.

V. Photographs on Polished Steel Plates. The next improvement consists in forming photographic pictures or images on the surface of polished steel plates. For this purpose, one part (by measure) of a saturated solution of iodine of potassium is mixed with two hundred parts of albumen, and spread on evenly as possible upon the surface of a steel plate, and dried by the heat of a gentle fire. The plate is then taken, and, while still warm, is washed over with an alcoholic solution of gallo-nitrate of silver, of moderate strength. It then becomes very sensitive, and easily receives a photographic image. If the plate be cold, the sensibility is considerably lower.

The image obtained is fixed by washing with hyposulphite of soda, and finally with water. The print adheres to the steel with much tenacity, and forms a process very useful to engravers.

With respect to this part of the invention, the patentees claim the production of a photographic image upon a plate of steel.

Upon a careful examination of this patent, it will be evident that the substitution of porcelain for glass, with very doubtful advantage, constitutes its only real novelty. The images on oiled paper are said to be exceedingly good, and this may be a valuable suggestion ; but it should never have entered into this patent, seeing that varnished paper has been used for other purposes for a great many years, and Mr. Talbot can no more patent a right to *tracing paper*, than he can to writing on other paper, for receiving photographic images.

From the London Art-Journal.

THE WORLD'S FAIR OF 1851;

ITS ERRORS AND ITS DANGERS.

[As many of our Daguerrian Artists intend visiting and exhibiting in the Great Fair of 1851, we think the following article will not be uninteresting to them:—Ed.]

We have on a former occasion stated, that four years ago we suggested and advocated the plan of an Exhibition in England similar to Expositions which take place in Paris, Brussels, and elsewhere—which it had been our duty to visit—and that we had corresponded on the subject with three leading members of Her Majesty's Government, whose response was, in brief, that "the time was not ripe for the experiment." Our plan, indeed, was less extensive than that which the autumn of 1849 saw announced under the especial patronage of His Royal Highness Prince Albert. We did not contemplate (at all events for a *first* exhibition) the generous and self-sacrificing invitation to all Nations, nor the covering so immense an area with buildings to receive the Industry of the World. As public journalists, we considered we should be out of place if we did more than suggest what might be, and ought to, be done; and accordingly we hailed as an auspicious event the more enlarged project of the Society of Arts and its illustrious President Prince Albert, and at once gave to it our hearty and zealous support. We did not limit such support to mere words of encouragement, but were the earliest of the public journals to tender, in aid, a contribution in money. While, however, we thus endeavored to promote an object we had ourselves long and earnestly advocated, our confidence was not with those who, it appeared, were guiding and governing the movement; and we guarded ourselves, for the future, by stating it would be our duty to watch with scrupulous—possibly with suspicious—care, over the proceedings then but commenced.*

From this task we shall not shrink—ungracious though it may be; and while we stigmatize, as most unjustifiable and most impolitic, the clamor that has been raised against the Exhibition, we must admit that to us the altered feeling regarding it is by no means unaccountable.

And while, on the one hand, we desire to prevent the Prince from being responsible for oversights and errors which have been disastrous, we, on the other hand, desire to preserve the public from a change of caprice, or apathy, or incapacity for forming a right judgment as to the result.

The time has arrived when it becomes our duty to *speak out*. One oversight has so regularly followed another; mistakes have been so continual; want of judgment has become so notorious; the "choppings and changes" have been just as numerous as the plans and proposals; every body seems to be suspicious, and nobody confiding; to collect further subscriptions will we fear, be a vain effort; to persuade manufacturers to exertion extremely difficult; and all these misfortunes have now to be endured in association with difficulties always hazardous, if not insurmountable—that we cannot but share the general apprehension of the issue being prejudicial to the best interests of Great Britain.

That which should have been our glory is in peril of becoming our shame; a course

* "Now we shall ill discharge our duty if we did not give to this project our zealous and cordial aid; it may not be all we could desire, either in its origin or procedure, but it is, in many respects, that for which we have been some years *hoping*. We have, indeed, as many of our readers know, continually labored to impress upon the public mind the policy of such an exhibition, and also its feasibility; and now when we see not only a probability, but an almost absolute certainty of its achievement, we shall not be among its lukewarm supporters. At present we shall do little more than supply, as we have done, an outline of the plan; from time to time we shall be called upon to report upon details, and to examine them carefully—not with suspicion, indeed, but without blind confidence,—giving to the directors of the Exposition such service as we can give, but retaining the right and power to watch closely and inquire minutely, for the protection of the Manufacturer and the good of the Public."—*Art-Journal*, Oct. 1849.

which might have been eminently useful to the British manufacturer is in danger of impeding his progress for many years to come. In the markets of the world, buyers will not pause to consider the circumstances which trammelled Great Brittain in the race with other nations of the world. The Exhibition was planned by us; we invited competition; the "show" is to be arranged by us; the inference will naturally be that we have done our best under circumstances peculiarly favorable to us.

We have been in communication, more or less, with a large majority of the leading manufacturers of England, and we speak from personal knowledge when we assert that their energies have been to a great extent paralysed by the lack of understanding, and absence of system, manifested by the Commission; by want of confidence in "the Executive," arising out of matters still more inauspicious; and, in particular, by the recent awards of the Building Commissioners, whose decisions the public regard as the shadows of coming events—believing such decisions to have been based on injustice, as they could not have been the results of ignorance. While, on the one hand, British manufacturers have been disheartened, on the other, foreign manufacturers are elated at the prospect that is to follow the opening of the Exhibition in 1851; and while the latter are making those active preparations which accompany the hope of success, and go far to ensure it, the former are—even in the month of July, 1850—postponing their exertions until they can obtain a clearer insight into the arrangements upon which will depend a verdict that is to be to them life or death.

The Prince—we say it with regret and with reluctance—the Prince has, from the commencement of this affair, been unworthily supported. His Council was not indeed of his own choosing; it was the creation of circumstances; but it is to be lamented that their

"Interdict and crooked ways,"

so opposed to the fair courses and daylight dealing that usually characterise and distinguish transactions in which Englishmen are engaged, have made so many lukewarm who were zealous, so many indifferent who were cordial, so many hostile who were at least neutral.

Let us not be misunderstood: the Royal Commission consists of noblemen and gentlemen of the nicest honor, entitled to the respect and confidence alike of the high and the humble; but it is no reproach to them to say they were entirely ignorant concerning the work they undertook, and very naturally supposed they were to be instructed by persons fully capable of guiding them aright; such instructors they expected to find in "the Executive," and especially in their Secretaries. All the disasters which have followed, we trace to the fact that these gentlemen were incapable of directing the Commission; their incapacity is the best excuse we can conceive for the "blunders" which have succeeded —one after another—up to the very moment at which we write. This evil might have been remedied if a few practical men had been added to the Commission; but whether it was considered *infra dig.* to mix up such men with the aristocracy, we cannot say: at all events, if we sift the Commission, we shall scarcely find one to compensate for the absence of experience, and other advantages, in the Commission generally, and in their Secretaries.*

Of the Prince who is at the head of the Commission it is impossible to speak too highly; he has secured the respect—may we not say the affection—of all classes in this country; and that by the exercise of sound judgment no less than by generous and considerate sympathies. But it was not to be expected that he could be the director of a project so novel; he had to delegate to others the duties to which he lent his high name. The end in view was creditable to his sagacity; but it is not to be concealed, that from the commencement, he lacked, to carry out the project,

* The jury of France consists of manufacturers of porcelain, muslins, carpets, instrument-makers, painters, &c.; manufacturers resident in various parts of the kingdom; and although some eight or ten are "representatives of the people," *i. e.* members of parliament; nineteen out of twenty are "practical men;" including, among others, the inspector of the veterinary schools. We cannot say who are their secretaries, but we have no doubt their selections to these important offices have manifested at least as much forethought and prudence as we might expect in a dealer choosing his foreman, or a gentleman the bailiff to his estate.

the means that should have been presented to him by ability, integrity, and experience in combination.

We say, the Council of the Prince was not of his own choosing; and we know it would not have been the choice of the Royal Commission. It was composed of a few members of the Society of Arts, while the Council of that society knew little or nothing of what was going on; the name of that society was used until it became inconvenient. But the Prince was in a manner compelled to be the lever by which the "Managing Committee of the Society of Arts" was to be elevated into notoriety; that Committee ultimately became the "Executive" of the Exhibition. Upon the construction of this "Executive" we have much to say—and may say it hereafter—in order to explain why, from the very commencement of the scheme, suspicions were engendered, which subsequently became—not subdued, but fostered.—Themselves, their brothers, brothers-in-law, sons, and sons-in-law, and cousins, have been so amply provided for as to create very general suspicion that personal and family advantages had more weight than public benefits in those upon whom the issue of the experiment was made mainly to depend. These and similar "untoward events" are more widely commented upon than the Prince, and perhaps the commissioners, have an idea of. They have had a grevious effect on the subscription list; although few have been bold enough to assign the real motives for holding back.*

The Secretary of the Society of Arts became the Secretary of the Commission—the most responsible position of the whole—one that required a large mind and great experience—far removed from the suspicion of wrong motives or undue influences: he was, in fact, the pilot of the ship when manned and at sea; and of his capabilities the proofs are before us—in the acts that have been done, those which are contemplated, and the general position of affairs up to the end of July, 1850.

Concerning the private contract entered into between certain members of the Society of Arts and Drew, the Attorney for Messrs. Munday, wealthy capitalists, who were to have made a private speculation of the concern, rumor has had much to say. It is asserted that the said contract took by surprise the then Council of the Society of Arts. It was not drawn up by their solicitor; nor could they distinctly ascertain by what solicitor it was drawn up. It was presented to them for signature, and they found in it clauses, which they considered and pronounced to be "monstrous," and refused to sign it. This was the beginning of differences between the Council and the certain members referred to, which ended in the objection of the Council, and the substitution of another Council, more yielding, in its stead.

"O, what a tangled web we weave,
When first we practice to deceive."

The various interviews which took place between the movers of the matter and H.R.H. Prince Albert were kept as "dead secrets" for a long time; in the end, after several visits to Balmorel and Osborne, as well as to Buckingham Palace, the Prince was effectually trammelled, and, as there was no occasion for secrecy, the matter came out. It is known that the first change made in the affair was the withdrawal of the contract with Messrs Munday—a contract which, if there had been open and fair dealing, never would have been entered into—and an agreement to return the money they had advanced, and to give them "compensation" for the disappointment to which they had been subjected. The claim for compensation under this agreement is understood to be 12,000*l.*; it is to be settled by arbitration; and it appears, according to Mr. Labouchere, that the Treasury has taken upon itself to liquidate *this* claim, taking the security of the Commissioners for repayment; such security meaning nothing more nor less, than that if there be funds to repay the Treasury, the Treasury will be repaid, if not, the

* When the Westminster meeting was about to be held, a young gentleman (the son of one of the executive committee), applied to be employed as *honorary* secretary. He was so. He has since been appointed *secretary* at a salary of £200 a year, with an under secretary—we understand a near relation of his own. We do not say that his services were unnecessary, or that they are overpaid, but this is another example of the underground way of working, of which we complain. It is said, indeed, that this young gentleman has recently obtained another appointment as secretary to another "subscription board," and with another salary attached to it.

sum must be paid out of the public exchequer; for the Chancellor of the Exchequer would not seek to persuade us that he contemplates proceeding against the Royal Commissioners individually or collectively.*

The next step—the next public step, that is to say—was the selection of missionaries to feel the pulse of the provinces; they were, we speak from our own knowledge, the relatives or personal friends of the gentlemen who subsequently became the Executive, and who were at that time much more truly the Executive than they have since been. Of the gentlemen so engaged we have no desire to speak with disrespect; but there was scarcely one of them—if there were one—at all fitted for the task; not one who was acquainted with the towns visited, the manufactures to be considered, or the general purpose of the project then promulgated. This was very rapidly discovered by the shrewd manufacturers of Manchester, Birmingham, Sheffield, the Potteries, and other places; and even the less calculating citizens of Exeter quickly ascertained that the gentlemen sent to consult or to school them, knew nothing of the business they were about. These gentlemen, coming as emissaries of the Prince, were indeed feasted at mayors' tables, and a vote of thanks for their "eminent services"—prepared beforehand—closed every meeting, at which they explained the wishes of His Royal Highness.

They were honored as men "having authority," but were listened to with impatience—as children instructing grown men. We say what we know when we affirm, that in every town in which they appeared, there was less anxiety to aid the movement after they quitted it than there had been before their arrival; and this, not alone in Manchester, where deception on the part of the missionaries gave great offence to the magnates of the town.

From the commencement then, there was, almost invariably, an underhand and un-English mode of procedure, which gradually diminished confidence and increased suspicion. There was nothing "open and above board." All hesitations were met and all objections refuted by a mysterious use of the Prince's name. He was made —most unfairly as regards him, and most unconstitutionally as concerns the public—personally responsible for all the statements that were put forth, for the good faith of preliminary arrangements, and for the ultimate results to the country; and opposition was construed into insult to His Royal Highness.

It is said, indeed, as a sort of apology for the appointments, that the Executive have no power; that they are mere servants to obey the orders they receive;—but herein is the source of the evil. If they had the confidence of the Commissioners and also of the public, such confidence being founded upon faith in their ability and trust in their integrity, all would go right; such an Executive we ought to have had *at any cost*. The experience of all public bodies may be adduced in proof that "confusion worse confounded" invariably attends the movements of any institution of which the managing committee is distrusted.

It is not only of dark and narrow alleys into which public feeling was forced out of broad and fertilizing channels—that we complain. The whole procedure has been conspicuous for indecision; yesterday, there was to be this, and to-day it was to

* In the House of Cmmons, in answer to Colonel Sibthorp, Lord John Russell said, with respect to the question whether any engagement had been entered into, the only one that had been entered into was under these circumstances: — before the Royal Commission was appointed there had been a contract with an individual with respect to an undertaking to pay the expense of the erection of a building, and other expenses connected with the exhibition, on certain conditions. When the commission was appointed, there were representations from various places in the country, very strongly urging that that contract should be annulled. The commissioners (he was not present that day) took into consideration these representations, and were unanimously of opinion that the contract ought to be annulled., but in order to do that it was necessary to enter into some assurance that the contractor should be paid the sum which, under certain circumstances, it had been agreed should be paid to him. The only engagement that the Treasury took was, that they would immediately find the money that was necessary to get rid of the contract, provided that they had security that the money should be paid to them. They got what they considered sufficient security, and, therefore, there would be no expense to the public. Colonel Sibthorp: May I ask the amount?—Mr. Labouchere: The amount is to be ascertained by an arbitration, which has not yet been made.—Col. Sibthorp: What security? — Mr. Labouchere: The security of the commissioners.

be that. The Munday contract was displaced by an arrangement which gave the honor of the enterprtse to the public.—The Exhibition was to be, like our great charities, "supported by voluntary contributions." Prizes of twenty thousand pounds were to be awarded yesterday; to-day success was to be recompensed by a brass medal, nominal value; and again, it is understood, prizes to the amount of twenty thousand pounds are to be given; yesterday, as announced by one of the commissioners, America was contracting to purchase, bodily, the whole collection; to-day it turns out that they will borrow as many things as exhibitors please to lend, and return them in safety when done with—copied and imitated: yesterday there was to be a building of brick and mortar; to-day it was to be of wood and plaster: yesterday there was to be a dome double the size of St. Paul's; to-day the dome had vanished into thin air; and now it appears the building is to be the very opposite of the thing asked for—and for which so many architects labored in vain—a huge conservatory of iron and glass; yesterday, the building was to be temporary; to-day it is more than likely to be permanent; yesterday a time was fixed for receiving applications for space; to-day that time is extended by six months. In fact, and in brief, we cannot call to mind a single arrangement that has not been changed, or a solitary rule that has not been to some extent altered. Do we regret these changes? No! principally, they were improvements; but we complain that the public was thus trifled with; that the Commission had no fixed principles; that its resolutions were like the ghosts of Banquo and his race—to

"Come like shadows, so depart."

And we affirm that thus was public confidence shaken; that thus enthusiasm was suffered to evaporate; and that now a very large majority of the Exhibitors are manifesting a disposition to strike their colors before competitors arrive in sight.

At the commencement of the plan the Prince's name was a "tower of strength;" the public were gratified to see another proof of his identification with British interests. There was something so agreeable in his dedicating time and energy (which so many illustrious personages devote to selfish enjoyment) to the promotion of commerce and manufactures, only of late years removed from the category of low pursuits, that his project (or, at least, the project called "his") was received with a degree of popularity approaching to enthusiasm.

And it becomes necessary to inquire, why not only this enthusiasm has subsided, but why that which was popular has become almost unpopular, and the generous exertions of His Royal Highness made, very nearly (most ungratefully as well as groundlessly), the foundation of charges against him.

Into the subject of A SITE it is needless for us now to enter; this has been decided; the sense of the House of Commons was taken, and it was determined by the vote of nearly four to one, that the Exhibition ought to take place in Hyde Park. It is not a little singular, that the outcry against the site was raised, only when operations there had actually commenced; Lord Brougham we believe, was the only person who publicly objected to it, and it is no exaggeration to say that he was rewarded with obloquy for his pains.

Thus, the outcry commenced only when the scheme had become unpopular. Persons who did not clearly see their way to urge, openly, objections against the Exhibition—because of the errors that had been committed, and apprehensions of mistakes, still more serious, to be made in due course—took up the *site* as a ground of battle. We feel assured that no expression of dissatisfaction against Hyde Park would have been heard, if there had been contentment with the scheme generally, and confidence in the commissioners, their secretaries, and the "executive" of the body.

It was, indeed, all sufficient to create general alarm when a monstrous, costly, and unpicturesque "dome" was threatened as a *temporary* erection: when the expense of a temporary building was expected to be ten times the cost of a temporary building, for similar purposes, in France; and, above all, when a mass of foreign competitors were recompensed for plans which were not only unasked for, but which nobody thought of carrying out; which were, in nearly every instance at

variance with the stipulations distinctly laid down, and which did not contain a single suggestion; while the plans of English architects, which strictly adhered to such stipulations, which were entirely capable of being worked out, and from many of which "suggestions" *were* taken, were, passed over without the reward of commendation.

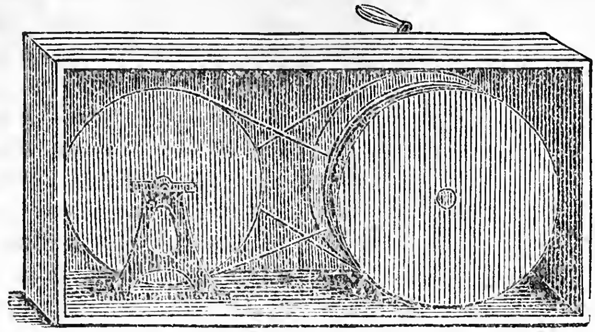
These, and other startling facts were received as "heavy blows and great discouragements" by British manufacturers and the British public; and the earliest available moment was taken advantage of to find cause of quarrel: that cause was the choice of site—selected though it had been so long before, and chosen as if by common consent of all orders and classes, with but one dissenting voice. We repeat, if there had been no growing and increasing discontent with the scheme generally, there would have been no opposition to it on this ground; a fact which receives confirmation strong from the paucity of argument against Hyde Park, and in favor of any other site.

It seems to have escaped the attention of both writers and speakers on this subject, that, although the building is to be "temporary," it is to be reconstructed at the end of five years—and of course in the same place. It has been clearly understood—and for that very reason, little talked about—that the Exhibition of 1851 is to be *the first of a series*; otherwise, the project could have received no cordial support from those who desired to find England triumphant with the other nations of the world. We are fully prepared to have the worst of it in 1851; and all advocacy of the plan is based upon knowledge that her opponents will be our teachers; and that we shall thus be taught to beat them in 1856. If there were to be no struggle hereafter; if we were to know that the supremacy of continental manufacturers—to be manifested in England, to the world, in 1851—were to be a thing settled for the remainder of the century, and that no future occasion were to be afforded for renewing the contest upon terms more equal than those which now exist, we should look upon the Exhibition of the Industry of all Nations as to the last degree disastrous to the best interests of the British manufacturer; for, of a surety, his inferiority in 1851 will be proclaimed everywhere; and it is only the hereafter that will be his recompense. After the beating he will receive in 1851, he will "go into training." He will gird up his loins to meet an adversary of whose strength of muscle and cunning of fence he has been made aware, and thus forewarned and forearmed, he will as certainly beat as he will surely be beaten. We do not hesitate to say, therefore, that the ground in Hyde Park must be occupied every fifth year under precisely similar circumstances to those which are to exist in 1851; and the inhabitants of that neighborhood must make up their minds accordingly.

An early announcement of the Commissioners in soliciting subscriptions was, that a surplus was hoped for and expected—who: to form a fund for *future exhibitions* of the works of Industry of all Nations in London.

To be continued.

PRACTICAL PHOTOGRAPHY.

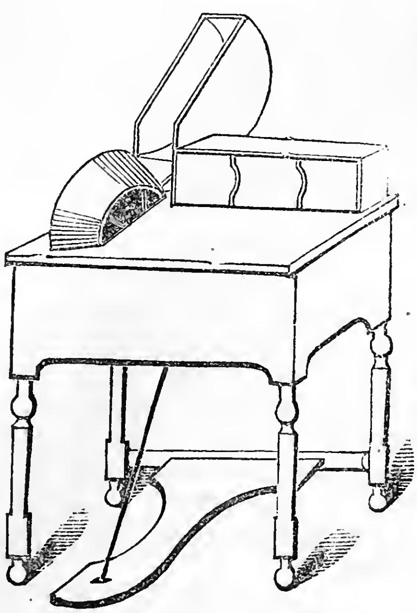


Buffing the Plate.—This is one of the most important parts of the process, and should be executed with great care. The minds of our artists are almost as various on this subject, as a politicians on his principles, and where they are careless, it goes as hard with them as it does with a candidate who has once filched the public trearury. Too much care cannot be observed in preserving the buffs free from dust—they should never be suffered to lie or stand about, but should have a close tin case or wooden box, perfectly tight, provided for them, where they may be constantly kept when not in use.

We would also advise the artist to brush them well immediately after using, and an occasional scraping with a piece of glass will be found of much service. We are of the opinion, and we find many operators concur with us, that the wrong side of the buckskin is in general use. We should use the outer or dark side. It is softer, of finer texture, and not so apt to present stiff hair points to the surface of the plate. The thickness of the leather should not be of so much consideration as its fine texture and softness. In choosing it be sure you get deer skin, as many sheep skins, we understand, are sold for buffs and they are by no means as good. Deer skins may be distinguished from the latter by vein-like depressions branching from the centre outward towards the edge, on the tanned or yellow side. If your leather does not possess this peculiarity, be sure you are not dealt honestly by, or that your dealer is ignorant of this fact.

It is scarcely necessary for us to advise artists to obtain rouge of the finest quality, for they all know the importance of so doing; but we may be able to instruct some how to choose it; and this is simply to taste it. If it does not feel rough and gritty to the tongue or has not a sulphurous taste, it is good. The tongue is very sensitive to the slightest touch, and if there be the least grit in the rouge it will detect it, and rouge so chosen, if kept carefully, will not scratch the plate.

The common hand buff is very convenient for artists of small means, but we would recommend the wheel to all who can afford them. There is no doubt that they perform the work better, and in a much shorter time. The engraving at the head of this article (Fig. 1) represents a very superior, economical and compact wheel, manufactured and sold by Mr. Anthony, 205 Broadway, New York, Peter Smith, Cincinnatti, Ohio, J. H. Fitzgibbon of St. Louis, and other dealers. It takes up very little room, is easily moved and kept in order, being enclosed in a box, and turns with such velocity, that the plate is buffed



in far less time than it can be by any other yet constructed. Another great consideration is its cheapness, the price being only $15 for half plate size, and $20 for whole plates.

Mr. Davie has also constructed a very good wheel. Fig. 2 gives a faithful representation of it ; but it is better calculated for artists permanently situated than for travellers. Next to the first named, it occupies less room than any other. The price we believe is $30.

The Messrs Lewis also manufacture a good article at prices varying from $30 to $60.

The Accelerating Buff.—This article, has made considerable commotion among the artists within the last six months, but it is not entitled to *all* the consideration it has received, although there is not the slightest doubt that it will accomplish most of what is claimed for it. It certainly reduces the time of operating very materially, and thus renders the difficulty of obtaining portraits of aged persons and children much less. It also renders dark days more available, and one of its most remarkable properties is, that the time is more reduced in cloudy weather than in clear. Its greatest objection is its aptitude to scratch the plate, prepare it ever so carefully, and many have thrown it aside, after trial, in consequence. That it works unevenly and eccentrically none who have used it will deny, and that the picture is not so well defined, but hazy, is equally true. We have stated the advantages and disadvantages of this article fairly, and leave the artist to adopt it or not as he pleases. A careful, neat operator may succeed well with them, but a negligent one, never.

They may be made as follows : Take a piece of clean suet, and spread it over a piece of leather the size of your buff stick, and melt it in evenly with a hot smoothing iron. Tack this on the stick, and over it another strip of buckskin, of an exquisite soft texture and as free from inequalities as possible, rub this covering down with a brush ; then scrape it well with a piece of glass till the surface is perfectly level ; then again brush it over thoroughly.

Or you may dissolve a piece of Castile soap in alcohol and soak the first leather in it. The solution may be about the thickness of cream. By the by, why would not cream be a good substitute ? for as the legend hath it, "beardless boys were wont to use it when they wished to ape their fathers."

We cannot refrain from laughing when we think of this buff and remember what a terrible bugbear grease was wont to be a few years back. We were once present when an operator took one of his boys severely to task for putting his fingers on the surface of the plate before it was cleaned. "How can you expect me to get good pictures," said he ; "if you grease the plate all over in that way. Don't you ever let me see you do it again."

In using these buffs a few light passes forward and back are sufficient ; the scum deposited by them being removed by a second buff. It may be as well to remark that the plate is first polished with rouge in the usual way.

If you wish to make your buffs, so that the ingredients of which they are made, may not be detected by others less knowing than yourself, you may scent them with a little oil of bergamot, lavender, or, to make them seem more valuable, a little ottar of roses, or musk.

—Our friend, Col. Whitney, one of our former daguerreotypists, and discoverer of the application of galvanism to photographic manipulation, is out with his new monthly, the Republic. Its object being to foster American talent and interests, commends it to every true American. The contents of the first number are excellent. More anon.

—It will be seen that we have commenced the publication, in our Journal, of Mr. Robert Hunt's celebrated work on "Researches on Light," the whole of which we shall give during the year. This work alone is worth the price of subscription. Several other works will be published entire.

—We have the pleasure of announcing that Professor Draper, of the New York University, widely known for his successful experiments in the art, will become a constant contributor to the Journal.

GOSSIP.

The first number of the Art-Journal is now before the Daguerrean world. We shall not endeavor, by fulsome self praise, to impress upon the minds of our artists its superiority, or even excellence, well knowing that if the pages of a work cannot, in themselves, win the approbation of the reader, no egotistical laudation will avail. We are not ashamed of our first number, and yet we shall improve each succeeding until we make it as perfect as science and art possibly can.

Since we first contemplated the issuing of our Journal—more than two years ago—we have given it close attention; consulted many first class artists and obtained their opinions as to the most popular and valuable form of placing it before the profession, and we think we have laid a foundation which will give it stability and secure the confidence of all. We would disdain any intention of opposing any similar publication, for we were not aware of anything of the kind being contemplated, until our day of publication was fixed and the manuscript of our prospectus in the hands of the printer—indeed, we should willingly have relinquished our project in its favor on hearing of the forthcoming paper, and so expressed ourself sincerely to Mr. Humphreys; but, on consultation it was considered most advisable—as some expense had been incurred and it was desirable to our friends—not to do so. We are also happy in having Mr. Humphrey's good wishes in the matter, and we believe with him that there is room enough for both, that no jealousy need exist between us; but, both with hands joined in good fellowship, strive for the accomplishment of the great object each has in view. We therefore tender him the right hand of friendship, with the assurance, we shall not be the the first to withdraw it. We are the more pleased in being able to do this, inasmuch as we find on the perusal of his first two numbers that our minds coincide on the various subjects on which he treats.

We are delighted to know that an attempt is being made to form a Photographic Society. This is a matter we have had on our mind for a long time, and shall urge it with all our heart and soul. There is nothing that will serve to dissipate the petty jealousies too prevalent among artists, or banish that malevolent aspersion of talent so prominent in newspaper advertisements, as a union of the profession in one great philosophical body. The advertisements of some artists are really becoming too disgusting to be tolerated by those who wish to command respect. The world is now too wise to be caught by such chaff, and we cannot deprecate too severely the spirit that prompts one man to attain notoriety by blasting the reputation of another. A laudable ambition to excel is praise-worthy, but we should leave others to judge of our merits—and as "many men have many minds," we shall always find enough of those who appreciate the different styles of each to secure a share of patronage.

We never hear two men quarreling about their respective merits without being reminded of the oyster. We will relate the anecdote for the benefit of those who have never heard it. Two countrymen passing along the sea-shore, espied an oyster, and immediately began to wrangle as to its ownership. One declared he saw it first, while the other had picked it up. Words grew high until a lawyer made his appearance, and they agreed to refer the subject to him. He took the oyster, opened it, swallowed the fish and handed a shell to each of the disputants. Wrangling Daguerreotypists can apply the moral.

Patent medicine venders may resort to this course to sell their nostrums, for their merchandize is like a sealed mystery and requires more imagination than common sense to make it palatable, whereas Daguerreotypes appeal at once to the delicate sense of the eyes, and will be appreciated according to the taste of the beholder—which, by the by, is not always very refined, but depends upon the state of the pocket; hence the reason for so many poor pictures being found among our people.

Daguerreotypists are not always at fault for these miserable specimens of the art, and they are frequently unjustly criticised by persons of refined taste on account of

them, for they are often obliged to suffer them to pass out of their hands in order to please a customer whose taste is more—to use a homely expression—for the mush and milk order than good hearty roast-beef. We have seen some of the most beautiful daguerreotypes returned, and others far inferior accepted in their stead, simply because the shades were burnt out, and the sitters opined they were better representations of their milk and water faces —and they generally were not far from right!

There is an opinion that has obtained considerable force among all classes; to the effect that it is impossible to get a good picture at the first sitting, hence they insist upon several, no matter how excellent the first daguerreotype may be. We know of an instance when an operator succeeded most admirably with the first plate, yet could not convince the lady—for it was a a lady—of the fact, and was obliged to humor her with six sittings; each time she was shown the same picture and each time she was better satisfied. After the sixth she was perfectly so, and took the daguerreotype with the remark, "I knew you could not get a good picture of me the first time." If operators would adopt this system oftener, they would please their customers equally well and not have to regret the exhibition of so many inferior daguerreotypes.

We learn with pleasure that Mr. L. Hill has succeeded in impressing the image upon the daguerreotype plate in all the beauty and brilliance of the natural colors. If this be true, we congratulate Mr. Hill on his success, and we are the more pleased—notwithstanding we have somewhat of which to complain in certain of his acts—as it establishes the truth of our assertions, made years ago, on this very subject. We are also highly gratified that the first successful attempts have been made in this country. Mr. Hill, however, is not the first who has made experiments towards its investigation, and, although we sincerely hope he may succeed in obtaining a patent, we fear he will find it difficult. We announce this a little nervously, but we trust Mr. Hill's assertions will prove all he wishes.

Here we must close our gossip for this time, as we have occupied all the space alloted to us. We trust our artists will communicate freely with us, and give us another opportunity for agreeable converse with them. Give us both the *sweets* and *bitters* of your experience.

Mr. Lester, having in his sketch of Mr. Brady's career as a Photographist, mentioned the beautiful serial, "THE GALLERY OF ILLUSTRIOUS AMERICANS," we shall take occasion to speak of the other gentlemen to whom no small share of the credit of that great national work is due.

Mr. D'Avignon has incontestably no superior in the world as a lithographer.—There have never been better lithographs made than those he has made for this Gallery from Brady's Daguerreotypes. Monsieur Jomart, the most celebrated connoissuer of Paris, and other distinguished members of the Academy of Arts and Sciences in the French Capitol, have given their attestation to this opinion, and many of the most distinguished scholars, artists and connoisseurs of England, Germany, Prussia, and Italy, have united in their tribute of respect and admiration for the superiority of those drawings by D'Avignon, over everything of the kind ever before attempted.

So far as the abilities of Mr. Lester the editor of this work are concerned, his fame has too long been established to require any enconiums from us. There have been few such samples of condensed and brilliant style in our language, and the whole work taken together surpasses in artistic beauty and typographical magnificence anything which has ever been published in this country or in Europe—and when we inform our readers of the fact that its typography was executed by Mr. Wm. B. Smith, our enterprising co-laborer in the Art-Journal, we feel assured they will be satisfied that the latter will always retain its present elegant appearance.

By their association together in the publication of so splendid and so difficult a work, Brady, D'Avignon and Lester have earned for themselves lasting reputation, and the public have already manifested not only a willingness but an enthusiastic desire to yield to them the honors they have won. This Gallery, which is now published and offered in superb gilt bindings for $15 a copy, will be regarded as the most superb ornament to our libraries

and saloons. A large number of copies have been ordered from different portions of Europe. Among its patrons are numbered the most distinguished men of this country, with its institutions of learning science and art.

— We have been requested to publish the following fine stanzas, and do so with pleasure. We shall never refuse anything of real value connected with the Daguerrean art:

STANZAS,

Suggested by a visit to Brady's Portrait Gallery.

Soul-lit shadows now around me;
They who armies nobly led;
They who make a nation's glory
While they're living—when they're dead,
Land-marks for our country's future,
Have their genius left behind;
Victors from the field of battle;
Victors from the field of mind—

Doniphan, who trod the desert;
Scott, who conquered on the plain;
Taylor, who would not surrender;
Butler, sleeping with the slain;
Houston, San Jacinto's hero;
Fremont, from the Golden shore;
Jackson, as a lion, fearless;
Worth, whose gallant deeds are o'er—

Webster, with a brow Titanic;
Calhoun's eagle look of old;
Benton, freedom's valiant Nestor;
Kent, the jurist, calm and cold;
Clay, "ultimus Romanorum;"
Cass, with deep and earnest gaze;
Wright, of yore the Senate's Cato;
Adams, last of early days—

Pere de Schmidt, the Jesuit preacher,
From the Rocky Mountains wild;
Tyng, Melancthon of the pulpit;
Channing, guileless as a child;
Barnes, who pondrous themes has written;
Bascom's eye, a gleaming bright;
Anthon, whose unceasing labor
Fills the student's path with light—

Audubon, from out the forest;
Prescott, from historic page;
Bryant, pilgrim of our poets;
Forrest, vet'ran of the stage;
Inman, looking palely thoughtful;
Huntington, with dreams of art;
Father Mathew, mild, benignant;
Jenny Lind, who wins the heart.

Lawrence, type of merchant princes;
Colt, of our mechanic peers;
Emerson, of Yankee notions;
Miller, of our Scripture seers;
Mott, the hero of the scalpel;
Cooper, wizzard of the pen;
Flagg, the glorious painter poet;
Powers, of arts own nobleman—

From the hills and from the valleys,
They are gathered far and near,—
From the Rio Grande's waters,
To Aroostook's mountain drear,—
From the rough Atlantic's billows,
To the calm Pacific's tide,
Soldier, statesman, poet, painter,
Priest and Rabbi, side by side.

Like a spirit land of shadows
They in silence on me gaze,
And I feel my heart is beating
With the pulse of other days;
And I ask what great magician
Conjured forms like these afar?
Echo answers, 'tis the sunshine,
By its alchymist Daguerre—

CALEB LYON, OF LYONDALE.

Broadway, Dec. 12, 1850.

— WE would call the attention of our readers to our cover, the first, or title-page of which we are, we think justly, proud. It is plain, simple and beautiful. There is no profusion in its design; nor is there anything wanting to indicate the idea of the artist—Daguerre, crowned by the Genius of American Art and Science—and we have had the satisfaction of hearing it pronounced by several literary men of taste and talent, the most beautiful engraving for a magazine ever yet produced. The other pages of the cover, it will be perceived, contain information of importance to every Daguerrean artist.

— We intend to devote portions of our future numbers to the Romance and Poetry of Daguerreotyping. There are a large number of artists through the Union whose peregrinations through the land give rise to numerous incidents, either of an instructive or amusing nature, which we should be pleased to weave into narrative for the benefit of our readers. Will not our friends, therefore, assist us, and send whatever may come under their observation? We have already many anecdotes, which we shall relate as occasions may offer to give them point. These, and any others with which we may be favored, will serve to relieve the more scientific portion of our Journal of some of its monotony, and still be interesting for their connection with the art. We wish, also, by this means, to bring out the talent of the profession, which we believe now lies dormant for want of some such stimulant.

☞ We publish the following with pleasure, from a gentleman who will hereafter be a valuable and constant contributor:—

Messrs. H. Hunt Snelling and W. B. Smith:—*Gentlemen*,—" An unbounded love and admiration for the art, and a sincere desire to see it rise still higher in character and excellence alone actuates both the editor and publisher."

If this noble sentiment gives birth to the work in embrio, "The Photographic Art Journal," it will indeed make a bright sunny day in the history of the beautiful art of Daguerreotyping. Old Sol will do his work more quickly, more exquisitely; and the heart of every true Daguerrian should rebound with joy and say—well, there is at last a zenith for us. History has buckled on his armor in our behalf; our troubles, our toils, and our deeds, have found a record, and posterity will keep sweet the memory of him who most deserves her sanctuary; and no longer will the Daguerrian be classed among fish-mongers, from the fact that one or more from the piscatory regions have laid by their nets and endeavored to robe themselves in the sunbeams of our divine art; and (Heaven save us) have been particularly successful on one or two occasions, and, by dint of hard labor, have produced on a plate the image of the tip end of some individual's nose, pronounced it a magnificent production of the art, and obtained as the reward of their *immense skill*, the approbation of the most critical *parvenus* of oysterdom. Most happily, however, the artists, (I mean those who work with the brush,) begin to think and speak of our art as it deserves, acknowledging that it does require some merit, taste, and a little genius to produce a Daguerreotype, fine in tone, position, and expression; for a Daguerreotype can possess these as well as a painting; but to obtain them the operator must possess the true refinement and discernment of the limner. To arrange the folds of the drapery gracefully and boldly, so that the lights and shadows may coincide with the character of the *face* and make it appear to the best advantage, is not the work of mere mechanical skill or accident. A harsh, a mellow, or a cold tone picture may be produced according to the taste and skill of the operator, as well as a graceful line drawn by the *hand of the painter.* I would not be understood as placing the Daguerrian on a par with the painter or sculptor, but most *emphatically* I will say, that our art is the hand-maid to those higher branches of the fine arts, and who will dare to say, we cannot compose and put poetry in our types as well as the painter in his sketch book; or that we cannot have our representatives of Faith, Hope, and Charity, as well as *Sir J. Reynolds*; a *Holy Family* as well as *Murillo;* or the Infant Saviour, with cross and lamb, as well as *Raphael.* To show that this can be done, I shall be most happy, Mr. Editor, to present you, for some future number of your work, a sketch from an original Daguerreotype of three young ladies, representing, Past, Present and Future, now in the gallery of M. M. Lawrence, Esq. In conclusion, all I have to say, is, go on with your very praiseworthy work. With your assistance our aspiring profession is bound to go up until, like Venice, it sits in the very midst of the sea of art.

I remain yours, with the
Highest respect,
Gabriel Harrison.

— We shall print a large edition of our first number, specimen copies of which will be sent to those desiring them. Those who receive copies are requested, in case they do not wish to subscribe themselves, to pass them around among their fellow-artists, who may feel so disposed, and thus increase its usefulness. We shall send no second number to those who do not subscribe after receiving the first, as we shall consider their silence a negative answer, and evincing a decided opposition to any improvement in the art, until such time as they may see the utility of our enterprize.

— We have to apologize for the delay in getting out this number, but we were disappointed in getting our paper, and after waiting ten days, were obliged to go to press with the best we could get. Our February number shall far surpass the present one, however; and we shall continue to improve until the Art-Journal shall be pronounced as perfect as it can be. Remember, that the more subscribers we have the more it will be improved.

ENGRAVED EXPRESSLY FOR THE PHOTOGRAPHIC ART JOURNAL.

M. M. Lawrence

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THE

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RESEARCHES ON LIGHT.

BY ROBERT HUNT,

Secretary to the Royal Polytechnic Society.

PART I.

The influence of the Solar Rays on compound bodies, with especial reference to their Photographic application.

SECTION I.—*On Metallic Compounds.*

CHAPTER I.

Preparations of Silver.

OXIDE of silver exposed for a few hours to good sunshine, passes into a more decided olive color, than characterises it when first prepared by precipitation from the nitrate of silver, and consequently the covered portions are lighter than those exposed. Prolonged exposure to the sun's rays, for a week or more, renders this olive color very much lighter, and the covered parts are found to be many times darker, than those on which the Light has acted directly. In some instances, where the oxide of silver has been spread on paper, I have noticed a very decided whitening process in some parts, after a few days' exposure; the cause of which, although diligently sought for, has not been detected. The oxide of silver dissolved in ammonia is a valuable photographic fluid. One application of a strong solution forms an exceedingly sensitive surface. The pictures on this paper are easily fixed by salt or weak ammonia.

NITRATE OF SILVER.—This salt in a state of purity, whether solid, or in solution in distilled water, does not appear to be sensibly affected by Light, but the presence of the smallest portion of organic matter renders it exceedingly liable to change under luminous influence. This property induced Sir John Herschel, in his early photographic experiments, to combine organic matter with the solution of the nitrate of silver, previously to its being applied to paper, and afterwards to introduce into the pores of the paper organised salts of silver, but without any remarkable results. The organic combinations have, however, since that time, been found of exceeding value in quickening the change of the salts of silver under exposure to Light. We have already seen that Count Rumford found the nitrate of silver in contact with charcoal, or an earthy carbonate was soon reduced to the metallic state under the action of strong sunshine.

A remarkable analogy between the effects of heat and Light deserves notice, and it is also of some practical importance in the preparation of the papers. If a piece of nitrated paper is placed upon hot iron, or held near a good fire, it will be found that at a heat just below that, at which the paper chars, the salt is decomposed. Where the heat is greatest the silver is revived, and immediately around it, the paper becomes a deep blue, beyond this a pretty decided green color results, and beyond the green, a yellow or a yellow brown stain is made.

PRISMATIC ANALYSIS.—The first published accounts of the effects produced by the spectrum on chemical preparations in general, were those of Sir John Herschel, to whom we are greatly indebted, for a very large amount of the most valuable information on this branch of the inquiry. I feel it a duty which I owe to this distin-

guished philosopher, to use his own words in describing these phenomena, as far as is practical, under the plan I have adopted, and to distinguish them from my own remarks, I shall in every case affix his name. The color of the impressed spectrum, on paper washed with the nitrate of silver, is, at first, a pale brown; which passes slowly into a deeper shade; that portion corresponding with the blue rays becoming a blue brown; and under the violet of a peculiar pinky shade, I have sometimes observed a very decided green tint on the point which corresponds with the least refrangible blue rays. The total length of the spectrum impressed on white paper, as well as the insensible gradations of its most refracted end will admit of measure, is about eighty-five parts. (*Herschel.*) Its limit of action is very nearly the centre of the yellow ray, and its maximum appears about the centre of the blue, although the action up to the edge of the violet ray is continued with very little diminution of effect: beyond this point the action is very feeble.

When the spectrum is made to act on paper which has been previously darkened, by exposure to sunshine under cupro-sulphate of ammonia, the phenomena are materially different. The photographic spectrum is lengthened out on the red or negative side by a faint but very visible red portion, which extends fully up to the end of the red rays, as seen by the naked eye. The tint of the general spectrum, too, instead of brown is dark grey, passing, however, at its most refracted or positive end into a ruddy brown. (*Herschel.*)

Photographic Application.—Nitrate of silver, although the most valuable of the salts of that metal to the photographer, as from it most of the other argentine compounds can be prepared, is not of itself sufficiently sensible to Light to render it of much use. It may, however, in some few cases, be advantageously employed. If well sized paper is washed over, with a solution of 120 grains of the salt, in a fluid ounce of water, and dried at a little distance from a warm fire, we form a paper, which for copying lace-work, feathers, and articles of which a perfect outline merely is required, answers very well. By soaking the paper previously to applying the wash of nitrate of silver, in isinglass, parchment size, a solution of gum-arabic, or by rubbing it over with the white of egg, it darkens much more readily, and eventually acquires a much deeper color. A pleasing variety of grounds for the pictures, may be produced by varying these organic combinations, and a still more interesting series, by precipitating organic liquids with solutions of lead, applying them in the state of cream on paper, and drying, before the nitrate is applied, as was recommended by Sir John Herschel. The influence of lead in exalting the oxidation of the silver salts under the action of Light, will be further described in the section on lead. Pictures formed on the nitrated papers are rendered permanent by simply washing, first, in cold and afterwards soaking in warm water.

Chloride of Silver.—This salt of silver, whether in its precipitated state, or when fused—horn silver—changes its color to a fine bluish grey by a very short exposure to the sun's rays, or even with prolonged exposure in diffused Light. If it is combined with a small quantity of the nitrate, the change is much more rapid, and the darkening process goes on to a deep brown, which slowly passes into a fine olive, and eventually, after a few weeks, the metallic silver is seen to be revived on the surface of the salt. It is somewhat remarkable, that great differences are observed in the color produced on chlorides of silver precipitate by different muriates. Nearly every variety in combination with the nitrate, becomes *at last* of the same olive color, it must therefore be understood that the following notices apply to the color produced by an exposure of a few minutes only to good sunshine, and it must also be recollected that the chloride of silver in these cases is contaminated with the precipitant.

Muriate of ammonia inclines the precipitated chloride to darken to a fine chocolate brown, whilst muriate of lime operates to the production of a brick-red color. Muriates of potash and soda afford a precipitate, which darkens speedily to a pure dark brown, and muriatic acid or aqueous chlorine, do not appear to increase the darkening power, beyond the lilac to which the *pure* chloride of silver changes by exposure. As far as my experiments have gone, it appears, that this difference of color is owing to the admixture of the earth or alkali used with the silver salt, and not to

the presence of organic matter, although it does, as in the case of the nitrate, produce similar varieties of color. The muriates of baryta and of strontia have some very peculiar colorific properties when in combination with the chloride and some other salts of silver, which will deserve our particular attention; however, as these peculiarities are more strikingly exhibited in some of the positive photographic processes, which will be shortly described, it will be more in place to reserve a description of them for a future section.

Prismatic Analysis.—The spectrum impressed upon a paper, spread with the chloride of silver, is often very beautifully tinted, the intensity of the colors varying very considerably with the kind of muriate used. Papers prepared with the muriate of ammonia or of baryta, and then with two successive washes of the nitrate of silver, have given me, when the sunshine has been favorable, a range of colors very nearly corresponding with the natural hues of the prismatic spectrum. Under favorable circumstances, the mean red ray, leaves a red impression on the paper, which passes into green over the space occupied by the yellow rays. Above this a leaden blue is discovered, and about the mean blue ray, where the action is greatest, it rapidly passes through brown into black, and through the most refrangible rays it gradually declines into a bluish brown, which tint is continued through the invisible rays. At the least refrangible end of the spectrum, the very remarkable phenomenon has been observed, in the first instance, by Sir John Herschel, of the extreme red rays exerting a protecting influence, and preserving the paper from that change, which it would otherwise undergo, under the influence of the dispersed light which always surrounds the spectrum. Although this is very evident, when the spectrum concentrated by a good achromatic lens, is received on the muriated paper, it is still more strikingly shown, if we receive the spectrum directly from the prism, without the interposition of the lens. It indeed appears to me, from many experiments made in this manner, that not only the extreme red ray exerts this very peculiar property, but the ordinary red ray, through nearly its whole length. Including this whitened portion, the whole extent of chemical action exerted is, "considerably more than double the total length of the ordinary luminous spectrum." (*Herschel.*)

Photographic Application.—It has been already stated, that the chloride of silver was used as a photographic agent by Wedgwood, Davy, and Daguerre, their success being but very limited. This salt became, however, in the hands of Mr. Fox Talbot, of the utmost importance. As it is to this talented experimentalist that we are indebted, for the first successful application of any chemical preparation on paper as a tablet on which Light should impress, with unerring fidelity, the objects it rendered visible, it is right that his process, which is indeed a very valuable one, should take precedence of any other.

"I select," says Mr. Talbot, "in the first place, paper of a good firm quality and smooth surface. I do not know that any answers better than superfine writing paper. I dip it into a weak solution of common salt, and wipe it dry, by which the salt is uniformly distributed throughout its substance. I then spread a solution of nitrate of silver on one surface only, and dry it at a fire. The solution should not be saturated, but six or eight times diluted with water. When dry, the paper is fit for use.

"I have found by experiment, that there is a certain proportion between the quantity of salt, and that of the solution of silver which answers best, and gives the maximum effect. If the strength of the salt is augmented beyond this point, the effect diminishes, and in certain cases becomes exceedingly small.

"This paper, if properly made, is very useful for all ordinary photographic purposes. For example, nothing can be more perfect than the images it gives of leaves and flowers, especially with a summer sun, the light passing through the leaves delineates every ramification of their nerves.

"Now, suppose we take a sheet thus prepared, and wash it with a *saturated* solution of salt, and then dry it. We shall find (especially if the paper has been kept some weeks before the trial is made) that its sensibility is greatly diminished, and in some cases seems quite extinct. But if it is again washed with a liberal quantity of the solution of silver, it becomes again sensible to Light, and even more so than it was at first. In this way, by alternately wash-

ing the paper with salt and silver, and drying it between times, I have succeeded in increasing its sensibility, to the degree that is requisite for receiving the images of the camera obscura.

"In conducting this operation, it will be found that the results are sometimes more and sometimes less satisfactory, in consequence of small and accidental variations in the proportions employed. It happens sometimes that the chloride of silver is disposed to darken of itself, without any exposure to Light; this shows that the attempt to give it sensibility has been carried too far. The object is to *approach* to this condition as near as possible, without *reaching* it, so that the substance may be in a state ready to yield to the slightest extraneous force, such as the feeble impact of the violet rays when much attenuated. Having therefore prepared a number of sheets of paper, with chemical proportions slightly different from one another, let a piece be cut from each, and having been duly marked or numbered, let them be placed side by side in a very weak diffused light for a quarter of an hour. Then if any of them, as frequently happens, exhibits a marked advantage over its competitors, I select the paper which bears the corresponding number to be placed in the camera obscura.

This variable sensibility of paper, prepared with the same ingredients, differing but very slightly in their proportions, admits of an easy explanation by a simple experiment. Precipitate upon a clean piece of glass a film of chloride of silver, which is best done in the manner recommended by Sir John Herschel:—A solution of salt of extreme dilution is mixed with nitrate of silver, so dilute as to form a liquid only slightly milky. And into this, at the bottom of a deep vessel, is placed horizontally a glass plate upon which the chloride is slowly deposited; the liquid being carefully drawn off with a siphon, and the last portions by fibres of hemp. When this is dry, we have a uniform film of the chloride of silver, chemically pure. If we take this plate, and having placed it at a very small inclination, expose it to Light, and drop upon its upper edge a small portion of the nitrate of silver, we shall see, that, as the nitrate of silver slowly combines, as it descends, with the chloride, it darkens very unequally; the edges of the descending liquid, giving the most rapid indications of sensibility to sunshine. From this we learn that to produce the most sensitive chloridated photographic paper, it is necessary to have only an exceedingly slight excess of the nitrate of silver, beyond that which is necessary to effect the entire decomposition of the salt used; but, as I have stated before, this excess is absolutely essential.

The following are the best proportions, with which my practice has made me acquainted, for producing papers sufficiently sensitive for use in the camera obscura:

Muriate of soda, fifty grains to one ounce of water; in which solution the paper is washed, and then carefully wiped over with a clean cotton cloth and dried.

A solution of the nitrate of silver, in the proportions of 120 grains to an ounce of distilled water, is then carefully applied twice over one side of the sheet, drying the sheet between each wash at a little distance from the fire.

Instead of the muriate of soda, it will often be found advantageous to use the muriate of ammonia (sal-ammoniac), in the proportions of thirty grains to an ounce of water; or the muriate of baryta, about forty grains, dissolved in an ounce of water.

For the less sensitive varieties of this kind of paper, the silver salt may be used in more economical proportions. No particular directions are necessary beyond those already given. Great care is of course required in all photographic manipulation, and the want of attention to the purity of materials used, their correct proportions by weight and measure, and the absolute cleanness of brushes, cloths, &c. will constantly lead to the most perplexing failures. It may be well to observe in this place, once for all, that the selection of paper for photographic purposes requires to be made with care. The thing to be aimed at is, to obtain as great a transparency as possible, combined with such a thickness as shall ensure perfect opacity in the dark parts of the drawings. It is also to be desired that the sensitive preparations should be retained as much on the surface as possible, for experiment will show, the most striking difference between the same preparation spread on a paper of a firm

texture and on an absorptive variety. The best kinds of paper, which are those known to the trade as hand-made and calendered papers, differ considerably on their two surfaces, one being much less absorbent than the other, which is the side that must be chosen as the one for spreading the sensitive washes over.

It was noticed by Mr. Talbot, in the very outset of his photographic experiments, that however carefully a paper might be prepared with the above materials, and the same applies to all others, it would sometimes turn out to be nearly, if not quite, insensible to Light in some parts of its surface. He thus describes this singular quality:—"Exposed to sunshine, this paper will exhibit large white spots of a very definite outline, where the preparing process has failed; the rest of the paper where it has succeeded turning black as rapidly as possible. Sometimes the spots are of a pale tint of cerulean blue, and are surrounded by exceedingly definite outlines of perfect whiteness, contrasting very much with the blackness of the part immediately succeeding." There can be but one opinion as to the cause of this very annoying peculiarity. The chemical compound used, exists in two definite and different states in the light and dark parts of the paper. We shall find, if we carefully examine the matter, that the same sheet of paper will absorb more moisture in some parts, than it will do in others, consequently we shall have (to cite the present case) a larger quantity of salt in some places than in others: and when we apply the nitrate of silver, portions of the paper will become covered with the chloride of silver, having the required excess of the nitrate of silver, while others will consist of the pure chloride, or a double salt, the muriate of soda and silver. Sir John Herschel proposes to remedy this "by saturating the saline washes used, previous to their application, with chloride of silver. By attending to this precaution, and by dividing the last wash of the nitrate into two of half the strength, applied one after the other, drying the paper between them, their occurrence may be almost entirely obviated."—In my own experience I have found this method generally answer the desired object, but it appears to be somewhat injurious to the sensibility of the paper. If the saline wash is applied with a sponge, and rubbed over, care being taken not to remove the pile of paper, it will be found that we are less liable to these spots, than when the paper is soaked in the solution.

A very pretty modification of these processes has been recommended by Sir John Herschel, which resulted from his experiments to ascertain how far organic matter was necessary to produce the change in the chloride and other salts of silver. A film of the chloride is precipitated on a glass plate, in the manner previously described and carefully dried in the dark. This pure chloride of silver is scarcely sensible to the influence of ordinary day-light, unless by a very prolonged exposure; but if it is washed over with a solution of the nitrate of silver, it becomes exceedingly sensitive, and may be used for receiving pictures in the camera obscura. These are very interesting and well defined negative pictures, which are direct or reversed according as looked at on the side which was exposed to Light, or the opposite. By pouring over these pictures a solution of hyposulphite of soda, they disappear, but on washing them with pure water, and drying, they are restored, and assume much the air of a Daguerreotype, when laid on a black ground, and still more so when smoked at the back; so that its character is in fact changed from a negative to a positive picture. (*Herschel.*) It is necessary that the plate should be exposed wet, and when withdrawn plunged instantly into water.

The action of Light having produced the required impression, it becomes necessary, to render these pictures permanent, that they should be subjected to some process, which should prevent the white parts from undergoing any change. Several plans have been recommended. Mr. Fox Talbot uses, and it appears with much success, a strong solution of common salt. This unites with the unchanged chloride of silver, and forms the double muriate of silver and soda, a salt which is not readily changed by exposure. Pictures so fixed, however, acquire, after some time, a peculiar dead blue tint, which interferes with the sharpness of the images very considerably. It does, indeed, appear that some slow bleaching action often goes on in the dark, upon the blackened portions them-

selves, and certainly the first application of a strong brine removes many of the most delicate and beautiful details of the drawing. Iodide of potassium has also been used; but this salt, under the combined influence of Light and moisture, acts more powerfully on the dark parts than the muriate of soda, and it has the unfortunate property of changing the white chloride of silver into the yellow iodide, which is fatal, where it is wished to take positive copies from the original negative pictures, as a yellow medium obstructs most powerfully, the free passage of those rays which darken the salts of silver. It is more desirable, if possible, to remove the unchanged chloride entirely from the paper; but there is some difficulty in ensuring this, as most of those preparations which dissolve the chloride of silver act with energy on the oxide. This is particularly the case with ammonia, which has sometimes been spoken of as a good fixing agent. The best solvent for the chloride is certainly the hyposulphite of soda, as recommended by Sir John Herschel. Some care is required in this fixing process, but with attention this salt will be found to be much more useful than any other agent. The drawing being produced, should be first soaked in clean water, to dissolve out as much as possible of the nitrate of silver. It is then to be immersed for a few minutes in water, to which a few grains only of common salt has been added, the object of which is to convert any portion of the nitrate that may remain in the paper into a chloride, as when any nitrate of silver is present the hyposulphite changes it to a sulphuret, the brown color of which is destructive to the beauty of the picture, and to its use for multiplying originals. When dry, it is to be brushed over, first on the face, and then on the back, with the solution of the hyposulphite of soda, and immediately immersed in clean water. Having been allowed to soak for a few minutes, it should be placed on a porcelain slab, and gently washed with a soft sponge and clean water, until the fluid flows off without any sweetness of taste; the combination of the chloride of silver and the hyposulphite producing a sensation of intense sweetness over the mouth. It is a peculiarity of this method of fixing, that nearly all the delicate parts which may appear to have suffered in the process, develop themselves again with considerable sharpness on drying.

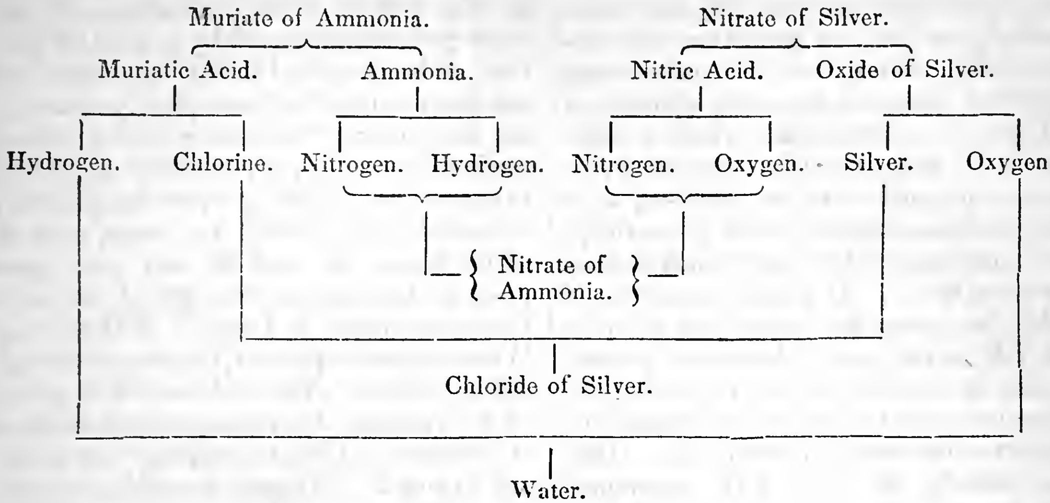
A very curious process of fixing, was first noticed by Sir John Herschel, and nearly about the same time dropped upon by the author, while endeavoring to fix some pictures produced by a positive process, to be described under the Iodides. It has the peculiarity of completely obliterating the picture, "reducing it to a state of perfectly *white paper*, on which the nicest examination (if the process be perfectly executed) can detect no trace, and in which it may be used for any other purpose, as drawing, writing, &c., being completely insensible to Light." (*Herschel.*) Where iodine is present, the paper becomes a deep yellow. This obliteration is effected by washing the picture with a solution of corrosive sublimate, soaking it in water, and drying it. Though invisible, the picture still exists, and may at any time be revived from its dormant state, by brushing it over with liquid hyposulphite of soda.

It should be noticed, that a very considerable difference will be found in the injury done to a photograph by the fixing process, according as it has been produced quickly under the action of a good sun, or by the prolonged influence of a more feeble light. Those produced in bright sunshine are not at all, or but slightly injured; whereas those which have been effected by a weak daylight, lose much of their sharpness, and indeed many parts are often destroyed.

We have now to consider the nature of the change produced on the chloride of silver by luminous influence, about which it appears some misconception has existed. The following experiments will set the question in a clearer light. A piece of paper, which had been prepared with the muriate of ammonia and the nitrate of silver, was placed in a perfectly dry tube with some potassium, and then hermetically closed and left in the dark for twenty-four hours, that the oxygen present might be absorbed by the alkaloid. The paper in the glass was then exposed to good sunshine for several hours, during which time it darkened considerably, but not nearly so much as a piece of the same paper, which was exposed openly for ten minutes only. The glass tube was opened in a solution of ammonia, but there was no indication of

free chlorine. However, on dissolving the salt formed on the potassium, it was found to be muriate of potash. This experiment distinctly proves the liberation from the paper of either chlorine or muriatic acid.

The change which takes place through the process will be best explained by a diagram.



In this state the materials exist in the paper, except that, as has been already stated, a little free nitrate of silver is also present. Under the influence of Light the chloride of silver is decomposed, and the liberated chlorine, combining probably with the hydrogen of some decomposed water, combines with the potassium to form the muriate of potash; while the silver is oxidised at the expense of the oxygen of the free acid and the water. Some suppose the darkened salt to be a sub-chloride of silver.

The absorption of oxygen, or rather its combination with the decomposing chloride, is proved by another very easy experiment. Some pure chloride of silver was arranged in a bent tube closed at one end, and the other end immersed in a bottle of distilled water. In this state the chloride was exposed for many days to the action of Light, during which time it was frequently shaken for the purpose of exposing the whole of the powder to its influence. As the chloride darkened the water rose into the tube, and it gave a precipitate of chloride of silver on the addition of the nitrate, thus distinctly proving the substitution of oxygen for chlorine under the agency of solar radiation. This explanation will also serve for the iodide and bromide, and some other salts of this metal, and it will not therefore be necessary to recur again to this matter except in a few especial instances.

Iodide of Silver. — Perfectly pure iodide of silver may be exposed for a long period to Light without undergoing any visible change, except perhaps in some case a more decided yellow color that is usual to it comes on; and this appears to depend on the influence of the calorific rays, as the same effect is produced by exposing it to a very moderate degree of heat. If, however, a very slight excess of the nitrate of silver is present, it becomes infinitely more sensitive than the chloride.

Prismatic Analysis.—The spectrum impressed upon a paper prepared with a weak solution of the hydriodate of potash presents some very remarkable peculiarities. The maximum of intensity is found at the edge of the most refrangible violet rays, or a little beyond it. Sir John Herschel places it at five parts beyond. I have found that it varies slightly according to the kind of paper used, and also with the quantity of free nitrate of silver present. The action commences at a point nearly coincident with the mean red of the luminous spectrum, where it gives a dull ash or lead color, while the most refrangible rays impress a ruddy snuff-brown, the change of tint coming on rather suddenly about the end of the blue or the beginning of the violet rays of the luminous spectrum.—(*Herschel.*) Beyond the extreme violet ray, or rather beyond the maximum point, the action rapidly diminishes; but the

darkening produced by these invisible rays, extends a very small space beyond the point at which they cease to act on the chloride of silver.

Photographic Application. — The use of papers prepaaed with the iodide of silver alone can only be recommended as affording a very pleasing variety of pictures, having a primrose instead of a white ground. The best proportions in which the respective salts of iodine and of silver can be used, according to my own experience, are the following: — Twenty grains of nitrate of silver should be dissolved in half an ounce of distilled water, and this with a very soft brush, carefully applied over the paper, and allowed to dry. Ten grains of the iodide of potassium dissolved in the same quantity of water, is next to be applied, and the paper quickly dried near the fire, care being taken not to warm it too much, as heat changes it from its delicate primrose color to a pink or rosy brown, which, although still sensitive, is not so much so as the parts which are not so altered.

In combination with other reagents, the iodide of silver becomes exquisitely sensitive, and from two such combinations, gallic acid and the ferrocyanate of potash, result two of the most sensitive photographic processes on paper with which we are acquainted. To these we must now direct our particular attention; and I shall give in the first place, Mr. Talbot's description of the very beautiful process, which he has named the Calotype, and then proceed to offer some remarks on the peculiar chemical action of the sensitive combination used.

The Calotype Process.—*Preparation of the Paper.* Take a sheet of the best writing-paper, having a smooth surface, and a close and even texture. The watermark, if any, should be cut off lest it should injure the appearance of the picture. Dissolve 100 grains of crystallized nitrate of silver in six ounces of distilled water. Wash the paper with this solution with a soft brush on one side, and put a mark on that side whereby to know it again. Dry the paper cautiously at a distant fire, or else let it dry spontaneously in a dark room. When dry, or nearly so, dip it into a solution of iodide of potassium, containing 500 grains of that salt dissolved in one pint of water, and let it stay two or three minutes in the solution. Then dip it into a vessel of water, dry it lightly with blotting-paper, and finish drying it at a fire, which will not injure it even if held pretty near; or else it may be left to dry spontaneously. All this is best done in the evening by candle-light. The paper so far prepared Mr. Talbot calls *iodized paper*, because it has a uniform pale yellow coating of iodide of silver. It is scarcely sensitive to Light, but nevertheless it ought to be kept in a portfolio or a drawer until wanted for use. It may be kept for any length of time without spoiling or undergoing any change if protected from the Light. When the paper is required for use, take a sheet of it, and wash it with a liquid prepared in the following manner:

Dissolve 100 grains of crystallized nitrate of silver in two ounces of distilled water; add to this solution one-sixth of its volume of strong acetic acid. Let this mixture be called A.

Make a saturated solution of crystallized gallic acid in cold distilled water. The quantity dissolved is very small. Call this solution B.

Mix together the liquids A and B in equal volumes, but only mix a small quantity of them at a time, because the mixture does not keep long without spoiling. Mr. Talbot calls this mixture the gallo-nitrate of silver. This solution must be washed over the iodized paper on the side marked, and, being allowed to remain upon it for half a minute, it must be dipped into water, and then dried lightly with blotting paper. This operation in particular requires the total exclusion of daylight; and although the paper thus prepared has been found to keep for two or three months, it is advisable to use it within a few hours, as it is often rendered useless by spontaneous change in the dark.

Paper thus prepared is exquisitely sensitive to Light, exposure of less than a second to diffused daylight being quite sufficient to set up the process of change. If a piece of this paper is partly covered, and the other part exposed to daylight for the briefest possible period of time, a very decided impression will be made. This impression is latent and invisible. If, however, the paper be placed aside in the dark, it will gradually develop itself; or it may be brought out immediately by being again

washed over with the gallo-nitrate of silver, and held at a short distance from the fire, by which the exposed portions become brown, the covered parts remaining of their original color.

The pictures being thus procured, are to be fixed by washing in clean water, and lightly drying between blotting paper, after which they are to be washed over with a solution of bromide of potassium, containing 100 grains of that salt dissolved in eight or ten ounces of water; after a minute or two, it is to be again dipped into water, and then finally dried. Where the bromide of potassium is not at hand, these pictures may be fixed with a strong solution of common salt.

The discovery of the extraordinary property of the gallic acid, in increasing the sensibility of the iodide of silver, was the most valuable of the numerous contributions which Mr. Talbot has made to the photographic art. The calotype process, as described and practised by Mr. Fox Talbot, yields pictures of exquisite beauty, which preserve with the utmost fidelity, not only the bold outline of the object, but its minute and delicate details. The charm of color alone is wanting, and this is compensated by the harmony of the whole. The gradation of shadow is often given in a really wonderful manner, the light of the picture decaying in soft and almost invisible tints into the deepest shades; the middle lights being preserved in a manner, which renders these pictures the most truthful studies for the artist who desires to fix the charms of Nature on his canvass, rather than those, so called, artistic effects, which are the bane of modern art, and destructive alike to truth and good taste.

The calotype picture is a negative one, having the shadows represented by lights, and lights by shadows; also reverse, as it regards right and left; but when fixed by the above process, a great number of positive copies, correct in all respects may be taken from it. To do this, it is only necessary that the drawing be placed with its face against the sensitive side of a piece of ordinary photographic paper, and being pressed into close contact by a board below, and a glass above, exposed for a short time to good sunshine. This period, of course, varies with the transparency of the original calotype, and the brilliancy of the sunshine. It must be remembered that the Light has to permeate a piece of paper, the yellow tint of which, offers considerable interruption to the free passage of those rays which are active in producing chemical change; we must therefore, be exceedingly careful to preserve the prepared sheet of as pale and uniform a tint as possible. All processes on paper, which require the production of the positive from the negative drawing, are, in one particular, alike defective. The irregularities of the paper itself are copied with the picture. This is only to be remedied by substituting some more transparent material, or getting a paper manufactured superior to any which is at present in the market, uniting transparency with firmness of texture and evenness of surface.

The part which the gallic acid plays in this process is sufficiently obvious. The chemical action of this acid on most of the metallic salts is well known, separating the metallic oxides very readily from the powerful acids. Since the attention of chemists has been more forcibly directed to the several phenomena connected with alterations produced in chemical compounds by luminous agency, numerons very curious instances have been discovered, of the continuation in the dark, of that change which Light has begun to produce. If we unite a solution of gallic acid and nitrate of silver, even in weak diffused Light, it will be found that a precipitate is almost immediately formed, whereas the same solution will often remain clear for many hours in the dark. If we apply this mixture whilst clear to any preparation of silver on paper, which is sufficiently sensitive, or has been exposed to Light for a sufficient time for a change to have commenced, the formation of the gallate of the oxide of silver, is carried on over those parts on which the solar rays have exerted their influence, with an energy equal to the intensity of the Light which has acted on the several parts, or, in other words, to the degree of change which the preparation has undergone; while, for some time, the parts in shadow, exerting no extraordinary power, remain clear and unchanged. To preserve these parts quite transparent, it is therefore advantageous to accelerate the decomposition over the other parts by the aid of caloric; and hence it is, that the talented discover-

er advises the drawing to be held for a few seconds, at a short distance from the fire. The gradual development of the calotype photographic picture, is, to a person who witnesses it for the first time, a phenomenon of a remarkable, indeed almost magical character Some experience is required to check the action of the gallo-nitrate of silver at the proper time; if it has not remained on the paper long enough, the opacity of the dark parts is not sufficient to ensure good positive copies; and if it remains too long, the light portions begin to darken, and, as this darkening proceeds with rapidity, the picture is soon rendered useless as an original from which copies can be taken.

The calotype process may, for many purposes, be most advantageously simplified; but before we proceed to this, it will be interesting to know, the particular action of pure gallic acid, upon several argentiferous preparations which have been acted on by Light. Paper simply washed over with the *nitrate of silver*, and exposed for two minutes in the camera obscura, which was the time allowed in all cases, unless it is stated to be otherwise, gave, when washed over in the dark, a very faint image. The *chloride of silver* on paper gave, under the same treatment, a good picture; but it wanted clearness and depth of color. The *bromide of silver* on paper gave, by an exposure of only one minute, a very beautiful picture. *Tartrate of silver*, even when the paper upon which it was spread was exposed for eight minutes, appeared insensible to the exciting power of the gallic acid. *Oxalate of silver*, exposed in the camera for ten minutes, gave an exceedingly faint representation. *Phosphate of silver* yielded a well-marked picture. *Carbonate of silver* in five minutes afforded a tolerably good result. Several of the compounds of benzoine, as formo-benzoate of silver, the benzoate of silver, and others, gave exceedingly pleasing pictures; and one, in particular, the *formo-benzoate of ammonia*, and the nitrate of silver, a photograph quite equal to those produced by Mr. Talbot's process; and I venture to recommend it for all purposes in which extreme sensibility, as for portraiture, is not required. Neither the pure *cyanate of silver*, nor the *ferrocyanate*, gave any sign of change after an exposure of five minutes whether washed with pure gallic acid or with the gallo nitrate of silver.* A great many other preparations of silver have been tried, and, as far as my researches have gone, it appears that whenever the salt used is sufficiently under the influence of Light to undergo a change, however slight it may be, the gallic acid will carry on the action in the dark and without heat, although the change is considerably accelerated by caloric. Gallic acid is therefore a most delicate test for any change produced, either by luminous or calorific radiation.

Mr. Channing of Boston appears to have been the first to publish any method by which the calotype process could be simplified. This gentlemen directs that the paper be washed over with sixty grains of crystalized nitrate of silver in one ounce of water, and when dry, with a solution of ten grains of the iodide of potassium in one ounce of water. It is then to be washed with water, and dried between blotting paper; it is now fit for use. A paper of a more sensitive kind is stated by the same authority, to be prepared by using a mixed solution of five grains of the iodide of potassium and five grains of the chloride of sodium in an ounce of water. My own experience enables me to say that but little, if any improvement can be made upon these proportions. A much weaker solution of the nitrate may be used, and this, on the score of economy is important. The most satisfactory preparations which I have yet employed are the bromide of silver, formed by washing paper first with a solution of silver as above, and then with a solution of twenty grains of the bromide of potassium in one ounce of water; and, as I have before stated, the formobenzoate of ammonia and silver, formed by washing the paper first with the formobenzoate, in the proportion of fifteen grains of the salt to one ounce of water, and then with the nitrate of silver as above. In good sunshine an edifice may be beautifully copied by either

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* Mr. Channing of Boston, in a paper on Photographic Manipulation, in the American Journal of Arts and Sciences, July 1842, gives the following series as being capable of being brought out by gallic acid :—" Iodide with chloride, iodide, iodide with bromide, bromide, bromide with chloride, fluoride, nitrate, ferrocyandide, sulphocyanide, cyanide."

of the two last processes in a minute, and by the others in about two minutes. To preserve these pictures of a clear white, it is advisable that they should be soaked in water for a minute, previously to the application of the gallic acid.

Dr. Ryan has shown the necessity of some care in the use of the iodide of potassium, into a solution of which, Mr. Talbot recommends the nitrated paper to be placed for a few minutes. If the paper is left too long in such a solution, the iodide of silver will be dissolved, that salt being soluble in an excess of iodide of potassium. Simply passing the paper through the solution appears to answer every purpose effectually. Mr. Collen has modified Mr. Talbot's process, by brushing over the paper with a weak solution of the ammonio-nitrate of silver, and in using the same solution in combination with the gallic acid, instead of the nitrate of silver.* It does not, however, appear to me that any advantage is gained by this mode of proceeding. A careful adjustment of the best proportions of the ingredients recommended by Mr. Fox Talbot, will be found to afford better results in a shorter time.

This calotype paper is capable of being used for the production of positive photographs by one process. Mr. Talbot, in his specification, thus describes his method: "A sheet of sensitive calotype paper is exposed to the daylight for a few seconds, or until a visible discoloration or browning of its surface takes place ; then it is to be dipped into a solution of iodide of potassium consisting of 500 grains to one pint of water. The visible discoloration is apparently removed by this immersion ; such, however, is not really the case, for if the paper were dipped into a solution of gallo-nitrate of silver, it would speedily blacken all over. When the paper is removed from the iodide of potassium, it is washed in water, and dried with blotting paper. It is then placed in the camera obscura, and after five or ten minutes, it is removed therefrom, and washed with gallo-nitrate of silver, and warmed as before directed. Engravings may be copied in the same way, and positive copies of them produced, but reversed from right to left. For this purpose a sheet of calotype paper is exposed to the daylight to darken it, as before mentioned ; but it should be darkened rather more than when intended to be acted upon in the camera. The engraving and the calotype paper must be pressed into contact by screws or otherwise, and placed in the sunshine, and the copy will be produced in a few minutes. If the copy is not sufficiently distinct, it must be strengthened by means of gallo-nitrate of silver.

No other paper which has yet been discovered, is sufficiently sensitive to luminous agency to admit of its being used for taking portraits from the life. Portraits of exceeding beauty and fidelity, may be procured without difficulty, by paying strict attention to Mr. Talbot's directions for preparing the calotype paper. The inventor prefers for this purpose, a camera the focal length of whose lens is not more than three or four times the size of the aperture ; and the head of the person whose portrait is to be taken, must be kept as steady as possible ; and, upon pointing the camera at it, an image is received on the sensitive calotype paper. No very good result can be expected, unless the paper is sufficiently sensitive to give a good image in twenty or thirty seconds. Mr. Talbot thinks he gains considerable advantage by carrying on the process in the open air, under a serene sky, without sunshine ; or if sunshine is employed, a screen of blue glass should be used to defend the eyes from too much glare, and thus prevent that distortion of feature which would otherwise arise.

Iodide of Silver and Ferrocyanate of Potash.—At the meeting of the British Association in 1841, at Plymouth, the author communicated to the Chemical Section, a method which he had discovered of preparing a highly-sensitive paper, with the iodide of silver and the ferrocyanate of potash. It will be found that paper prepared with the iodide of silver, and then washed with a solution of the ferrocyanate of potash, will blacken almost instantly on being exposed to the sun's rays. This effect will take place with the greatest rapidity, when the iodide of silver on the paper is as free from admixture as possible. Perfectly pure iodide of silver does not ap-

* Mr. Collen does not use the ammonia-nitrate of silver in the calotype process. It is only used by that gentleman on the paper for receiving the *positive* impressions. The error arose from the author's having placed reliance on a statement very circumstantially made in a publication on photogenic manipulation.

pear to undergo any change when exposed to Light. Under the prismatic spectrum, the space covered by the red rays is rendered very yellow, an effect due to the heat of those rays alone. Gallic acid gives evidence of some disturbance beyond this, having taken place, over that part on which the more refrangible rays fell, by producing in the dark various shades of darkness. If, however, upon some pure iodide of silver, spread out on glass, and exposed to Light, we drop a little of a solution of the ferrocyanate of potash, an instantaneous darkening will take place and extend, in different degrees, over the whole space moistened by that salt.

Although this effect is produced, when the iodide of silver is formed on paper, with the respective salts, in almost any proportion, provided the alkaline salt is not in excess, the best effect is produced when paper is prepared in the following manner:

A piece of well-glazed letter-paper is washed over on one side with a solution of nitrate of silver—two drachms to one ounce of distilled water. It is then dried at a little distance from a warm fire, as speedily as possible. It is next washed over with a solution of the iodide of potassium—one drachm to one ounce of water—and being placed upon a smooth board, or a porcelain slab, pure water is poured slowly and uniformly over the paper to wash away any soluble salts. It may be used immediately, or dried, and kept for future use. To use this paper, it is washed over with a saturated solution of the ferrocyanate of potash (*yellow prussiate*), lightly dried with blotting paper, and placed in the camera. A few minutes are quite sufficient to give a very beautiful negative picture. Leaves of plants, or engravings, are copied with very great sharpness of outline, by the exposure of a moment to sunshine.

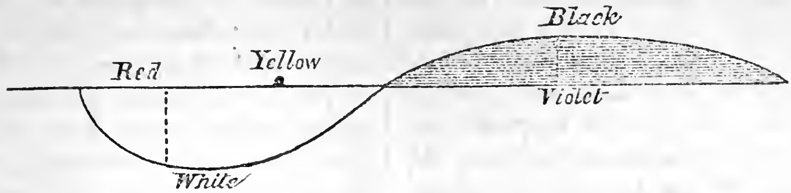
I stated in my first announcement of this process, that if the paper when washed with the solution of the ferrocyanate was dried, it was insensible to solar agency. If, by high drying, all the hygrometric moisture is removed from the paper, this is pretty nearly true; but under the ordinary conditions, the paper will change with tolerable rapidity, but not so rapidly as when moist, nor does it eventually arrive at such a degree of blackness.

Extremely rapid as the change which takes place is, it may be very much quickened by first bringing on a degree of oxidation on the iodide of silver, either by heat or Light. If the paper is allowed to brown under the influence of either of these elements, and then washed with the solution of the ferrocyanate, the change is almost instantaneous. It is, however, unfortunate that this previous darkening, interferes with the transparency of the paper so much, that positive copies cannot be obtained from these negative photographs.

The fixing of these photographs appears to be a matter of some uncertainty. It frequently happens that di erent specimens all fixed by the same process, have different degrees of permanence, some of them fading very rapidly, and others enduring for a long time, without the slightest appearance of change. This arises from the obstinate retention of a portion of the ferrocyanate in the paper, the presence of the smallest quantity being eventually fatal to the picture. This action of the ferrocyanate of potash was first pointed out by Sir John Herschel, who used this salt as a fixing agent; but he soon abandoned it on this account. The most successful mode is to soak the photograph for some time in warm water, which should be frequently changed, after which it should be brushed over on both sides with a weak solution of the iodide of potassium, and then again soaked in cold water for five or ten minutes, and dried.

Prismatic Analysis.—The spectrum produced upon the iodide of silver has been already described. After the application of the ferrocyanate of potash, the paper blackens with extreme rapidity, the darkening process commencing in the violet rays, and extending over the whole space, occupied by the invisible chemical rays, and all the visible spectrum down to the extreme red rays. If removed as soon as the first darkening is seen to take place, a colored spectrum will be found impressed, the red rays impressing a red color, and the blue ones blue. In a short time a bleaching action comes on under the red rays, and extends upwards to the green.—In the first action there is no evidence of any protecting influence in the extreme red ray; but when the bleaching effect is set up, the space occupied by the extreme red ray is maintained perfectly dark. I

have been very kindly favored with a prismatic analysis from Sir John Herschel, which quite confirms my own results,—the spectrum this distinguished philosopher obtained being of this character:



Advantage has been taken of this bleaching property, for the production of positive photographs by the first process. The plan pursued, is essentially, to darken the paper after the application of the ferrocyanate, and then to throw the balance in favor of the whitening effect, by washing over the paper with a tolerably strong solution of the iodide of potassium. Some processes, which are much more certain, and which give more permanent pictures, will presently be described.

The increased sensibility of this paper, appears to depend on the united decomposition of the ferrocyanate of potash and the iodide of silver. It is well known that the ferrocyanate of potash is decomposed by prolonged exposure to the sun's rays, and a portion of prussian blue formed. It will be found that this decomposition is brought about with much greater rapidity, if iodide of potassium is mixed with the ferrocyanate; and this appears to be the case with most of the metallic iodides: with the iodide of silver this is very decided.—Chemical philosophy affords us numerous examples, of the power which one body possesses of setting up an action similar to its own, in bodies brought into contact with it. Here we have two bodies in, what appears to be, almost chemical union, each one subject to change under solar power, exerting this *catalytic* influence, as it has been called, upon each other.

The ferrocyanate of potash will, in all probability, be found equally useful in quickening the change upon other photographic materials. I find that it accelerates the darkening action on the bromide of silver considerably; and it acts powerfully upon the chloride in some instances.

Positive Photographs formed by the Hydriodic Salts.—If photographic paper which has been darkened by exposure to Light, is washed over with the hydriodate of potash, it is speedily whitened by the same agent. This property was observed by Herschel, Talbot, Lassaigne, Fyfe, and the author, about the same time. This interesting character of the photographic processes founded upon this peculiarity, led me to pay considerable attention to them. The results of my inquiries were published at the time in the "Philosophical Magazine,"* since which but little has been added to our knowledge of the subject.

To avoid unnecessarily complicating this part of my treatise, I shall refrain from entering into that very minute detail, which is given in the paper above referred to, and confine myself to an explanation of the best mode of preparing a good photographic paper, on which, by the united agency of the hydriodates and the solar rays, perfect pictures may be produced in the camera or otherwise, having their lights and shadows correct as in nature. It is necessary to remark, that more exact attention is required in the preparation of this kind of paper, than in almost any other; very trifling differences in the proportions of the ingredients used, and in the time occupied in the first darkening process, completely changing the result, as will be hereafter explained.

In preparing this kind of paper, almost any of the sensitive salts of silver may be used. Dr. Fyfe prefers the phosphate of silver. Lassaigne, Bayard, and Talbot, use the chloride of silver. Verignon, however, recommends a combination of the chloride and bromide of silver. My own experience is much in favor of the chloride. Muriate of ammonia and muriate of baryta produce much better effects than any other muriates, the bleaching action being more easily excited, and the resulting pictures being of a more beautiful character.

Good letter-paper is soaked for five or ten minutes in solutions of either of the

* Philosophical Magazine, Vol. xvii. No. 109., September, 1840.

above salts—forty grains of the salt to four ounces of water. Each sheet is then carefully removed, and being laid on a porcelain or marble slab, gently wiped over with very clean linen. It is then dried. When dry, the paper being pinned out upon a board, it is washed over with the following solution:

Take of crystallized nitrate of silver 120 grains, and dissolve it in twelve fluid drachms of distilled water; to this solution add four fluid drachms of alcohol, which will render the mixture opake.—After a few hours, a minute quantity of a dark precipitate falls, which must be separated by the filter.

This solution must be applied with a very soft sponge brush, boldly but lightly, over one surface, and the paper carried directly into the sunshine. It is instantly changed, but usually it darkens very unequally, owing to the irregular absorption of the fluid by the paper. After it has been exposed for a few minutes, it is removed, and being again washed over with the argentine solution, it is a second time exposed, and kept in the sunshine, until a very regular fine chocolate brown color is produced. It is then dried in the dark and preserved for use.

It is necessary that great attention should be paid to the quantity of Light to which, in this part of the process, these papers are submitted. The morning sun should be chosen, and a perfectly cloudless sky, if possible. It may appear unlikely, but nothing is really more true, than, that these papers indicate to the practised eye in the bleaching operation, the effects of every cloud which has obscured the sun's disc during the darkening process. A peculiar film, as if the washes had been applied with a dirty brush, is produced by every such check.

To use the papers thus prepared, it is required that they should be washed over with an hydriodate, and exposed to the sun's influence wet. The iodide of potassium being the salt which is most easily obtained will be generally preferred. It is very difficult to decide on the best proportions in which this salt should be used, the difference of a few grains only, wonderfully altering the result: in general about 30 grains of a pure salt to one ounce of water, will be found to produce the best effect. In some experiments instituted to settle this important point, it was found that papers washed with a solution containing 100 grains to the ounce, required twelve minutes to bleach in the direct rays of the sun; whereas papers washed in a solution of the strength above recommended, took but four minutes. For the camera obscura I would recommend the use of the hydriodate of baryta over every other preparation; and if by throwing down some of the baryta by a drop or two of dilute sulphuric acid, we set free a little hydriodic acid, it acts much more energetically on the darkened paper, giving in the camera, provided a good clear image is formed, and a due portion of Light admitted, a very beautiful positive picture in half an hour. When engravings are required to be copied, which they may be most beautifully by this process, they should be soaked in water, and superimposed on the photographic paper quite wet. The object of this is two-fold—to ensure transparency, and the closest possible contact; the interposition of a film of air interfering with the result. Although it may appear, that there is much which is perplexing in this process, a little attention will soon render any one perfect in the manipulatory details, and then the results are certain. Pictures taken from nature with the camera in this manner possess extreme beauty. The fine contrast of the shadows with the lights, give them the character of finished sæpia drawings; and the gradations of tint, corresponding with the amount of Light radiated from different objects are very pleasing.

These drawings may be most perfectly fixed, provided they are kept in a portfolio, and only exposed to the sunshine *occasionally*, by washing them in clean water, which removes all the hydriodate that has not been decomposed. If, however, these drawings are exposed continually to Light, and to the influence of atmospheric changes, they slowly fade out, and in a month or two no trace of a picture remains. This may be thus explained. If a darkened paper is washed over with an hydriodate, and exposed to sunshine, it is at first bleached, becoming yellow; then, if long exposed, it again darkens. If in this state, it is put aside in the dark, it will in a few days, be completely bleached;

by exposure to Light it may be again darkened, but not so readily as at first, and the yellow color is again restored in the dark.

If a dark paper, bleached by an hydriodate and Light, be darkened, and then placed in a bottle of water, the yellow color is much more quickly restored, and bubbles of gas will escape freely, which will be found on examination to be oxygen. If placed in an exhausted vessel and hermetically sealed, the drawings thus formed are quite permanent, however much they may be exposed to sunshine. From this it is evident that the gradual fading arises from the influence of atmospheric moisture. The water is slowly decomposed under luminous influence, the hydrogen unites with the iodine to form hydriodic acid, which converts the darkened portion again into the yellow iodide.

A few interesting experiments will place this question in a much clearer light. Precipitate with any hydriodate, iodide of silver from a solution of the nitrate, and expose the vessel containing it, liquid and all, to sunshine. The exposed surfaces of the iodide will blacken ; remove the vessel into the dark, and after a few hours all the blackness will disappear; we may thus continually restore and remove the blackness at pleasure. The next experiment not only illustrates the phenomenon we are considering, but it further shows, in a very marked manner, the influence of Light in producing chemical change. In one watch-glass was placed a solution of the nitrate of silver; in another, the solution of the iodide of potassium. The two glasses were connected by a filament of cotton, and a circuit made up with a piece of platina wire. This little arrangement was exposed to Light, and in a very short time iodine was liberated in one glass, and the yellow iodide of silver formed in the other, which blackened as quickly as it formed. A similar arrangement was placed in the dark. Iodine was slowly liberated ; *no iodide of silver formed*, but around the wire in the glass containing the silver solution, a beautiful crystalization of metallic silver. If the glasses in which the processes of decomposition have taken place, be placed in the dark, it will be found, in a few hours, that the solution which has become brown, from the liberation of iodine, again gets gradually clear, and the darkened precipitate is converted into the yellow iodide of silver. The power of the sun's rays in influencing or disposing chemical affinity is very marked in these experiments.

Prismatic Analysis.—In my popular Treatise on Photography, I have shown, that the bleaching action is carried on by the influence of the blue and the more refrangible rays ; also, that the least refrangible portion of the spectrum acts powerfully on the prepared surface, and induces an *extreme degree of blackness.* This peculiar and complex action has been much more fully examined by Sir John Herschel, who repeated the analysis with papers prepared by the author.* When a paper prepared as above was exposed to the spectrum, and washed with a solution too weak fully to excite it, two contrary actions were produced by the rays above, and below the zero point or mean yellow. By the former the paper was bleached, the action beginning in the least refrangible violet, and extending upwards a considerable distance, and downwards to the circumference of a semicircle, having the point at which the action commenced for a centre. By the latter the paper was darkened, the blackness spreading upwards and downwards ; upwards till it passed the zero point, and nearly or quite attained the semicircle above mentioned, and downwards to a space beyond the extreme red ray. By repeatedly washing the paper with the hydriodic solution, both actions grew more intense, but the bleaching action the most so. At length, by repeated washings, the darkness produced at the lower part of the spectrum began to give way, and was slowly replaced by a very feeble bleaching, which at length extended very far indeed below the extreme red rays, and upwards to join the semicircle c. Within this semicircle and its train, a somewhat dark, perfectly circular and well-defined solar image arose, its diameter being somewhat less than that of the semicircular terminations, so as to leave a perfectly clear and distinct white border all around it, as represented in No. 2. This circle gradually extended itself into an oval or tailed form, but preserving its circular

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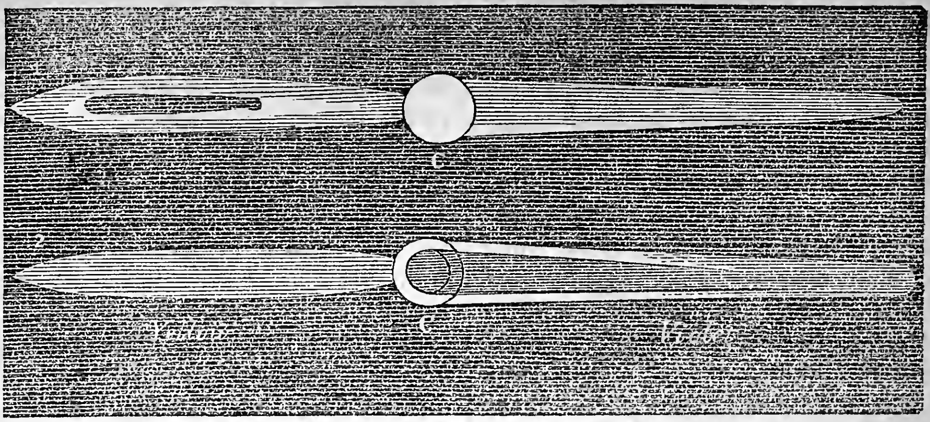
* Sir John Herschel on the Action of the Rays of the Solar Spectrum (Philosophical Transactions.)



shape below, and maintaining the white border inviolate. Finally, after long-continued action, the interior browned oval above-mentioned, was found to have been prolonged into a figure of the annexed form, of which the termination by a narrow

neck and circular enlargement, indicates the definite action of a ray much further removed along the axis of the spectrum.

We shall perceive from this that four distinct actions are exerted on these papers—1st, Bleaching by the most refrangible rays. 2dly, Blackening by the least refrangible. 3dly, Darkening by the most refracted portion of the spectrum; and, 4thly, Bleaching by the rays of least refraction. The two last actions may be imitated to a considerable extent by radiant heat, and I have but little doubt that the bleaching by the red rays is due to thermic influence. The two first actions it will be evident, are, first, the formation of the iodide of silver, and, secondly, the reoxidation of this iodide. The definite space to which the rays are confined, are very remarkable, and appear to point to an involved system of solar emanations, which we are not in a situation at present to explain.

These very peculiar influences, may be most prettily illustrated, by placing a piece of the prepared hydriodic paper, with an engraving superposed, behind four pieces of colored glass. Beneath a blue glass the engraving will be very perfectly copied with correct light and shadow. If a deep green glass is used, a negative picture will result, from the blackening of the paper, and the same takes place under a yellow glass; but under a glass stained red with oxide of gold, a negative picture is formed, not by the darkening of the oxide of silver, but by the eating out of *strong lights* on all the lines which correspond with the *dark parts* of the engraving, these parts having the most calorific influence.

Experience has convinced me, that the use of colored glasses, in any experiment which has for its object, the elucidation of any of the phenomena connected with the chemical power of the sun's rays, is to be avoided, as leading to error in many cases, and giving uncertain results in all. No correct conclusions can be arrived at in any way but by prismatic analysis. The above, and some other experiments, which are to be found in these pages, are only given, as an easy way of showing some of the very peculiar and beautiful phenomena, with which the art of photography has made us acquainted. I shall, in a future page, make some remarks on the influence of colored media, when I shall endeavor to show, the numerous sources of error to which we are liable, when we trust *solely* to their use, however carefully they may have been analysed by the prism.

Ioduret of Silver.—If upon a plate of

polished silver we place a small piece of iodine, and apply the heat of a spirit lamp or candle beneath the plate for a moment, a system of rings is speedily formed, which is somewhat remarkable. To these rings Mr. Fox Talbot first called attention. The first ring, and which spreading constantly, forms the exterior of the circle, is of a bright yellow color; within this, their arise successively, rings of green, red, and blue colors, and then again a fine yellow circle, centered by a greyish spot on the place occupied by the iodine. On exposing these to the Light, it will be found that the outer yellow circle almost instantly changes color, and that the others slowly change, in the order of their positions, whilst the interior yellow circle resists for a long time the solar influence.* These rings must be regarded as films of the ioduret of silver, varying, not only in thickness, but in the more or less perfect states of combination in which the iodine and the metal are. The exterior circle is an ioduret, in an exceedingly loose state of chemical aggregation: the attractive forces increase as we proceed towards the centre, where a well formed ioduret, or probably a true iodide of silver, is formed, which is acted upon by sunlight with difficulty. The exterior and most sensitive film constitutes the surface of the Daguerreotype plates, which process, with its improvements, must now be described. The changes which these colored rings undergo are remarkable; by a few minutes exposure to sunlight, an inversion of nearly all the colors takes place, the two first rings becoming a deep olive green, and a deep blue inclining to black. It is a very pleasing experiment, to form those beautiful rings, by placing a small piece of iodine on a little silver leaf, and then, covering one half of them with an opaque body, expose them to the solar rays.

The Daguerreotype.—The material used as the tablet, upon which the solar radiations are made to impress external nature, is copper plated with silver. The copper serves principally to support the silver foil, but it has been stated with some degree of correctness, that the combination of the two metals tends to the improvement of the effect. It is essential to success that the silver should be brought up to the most perfect polish. This is best done by polishing with cotton dipped in sweet oil, and finely levigated Tripoli powder, or rotten stone.* The cotton is to be frequently changed, and great care must be taken that the plate is not touched with the fingers. Dry cotton and very fine Tripoli dust must be used to complete this part of the process. The plate is then subjected to the heat of a spirit lamp, or a charcoal fire, for a few minutes, and cooled as speedily as possible, by placing it on a mass of metal or a stone floor; the object of this is to remove the organic film which the oil has left on the plate. Daguerre has recently stated it as the result of his experience, that any organic or atmospheric film, interferes with the rapidity of the operation; hence, after having polished the plate, he floats it with pure water, and heats it to a high degree over a spirit lamp, and afterwards pours off this layer of water in such a manner, that its surface, on which the film, or any sediment removed, may float, shall not touch the plate; after this, the plate is not again polished. This film has been stated by some to assist in the formation of images, but experience has shown, that too much attention cannot be bestowed on its removal. The plate, when cold, should be finished off with cotton dipped in a solution of one part of nitric acid to sixteen of water, and then with dry and clean cotton.

The next operation is to form on the surface of the silver the sensitive film. On the success or otherwise of this operation everything depends. The plate, when viewed by a very weak artificial light, should present a perfectly yellow and brilliant surface. Several plans have been suggested, by which the iodine may be made to attack the plate equally; but all of them requires, on the part of the operator, the closest care and attention. The most easy, and, at the same time, the most certain appears to be the following. Some cotton wool

* Mr. Fox Talbot informs us, that in 1838 he discovered the method of rendering a silver plate sensitive to light, by exposing it to iodine vapors. Daguerre did not publish his process until August, 1839. It is curious to observe, how very near the English experimentalist approached to the discovery, which has given universal fame to the French artist.

* Polish with spirits of wine has been recommended in preference to the use of oil.

being placed very evenly on a board the size of the silver plate, is saturated with an alcoholic solution of iodine, and allowed to dry in the dark in a cool place. This board is laid in a box, and the silver plate placed about two inches above it, being supported at the four corners. The cover of the box being closed, all is allowed to remain in this state for two or three minutes, when, on removing the plate, it will generally be found that the required fine yellow surface is produced.

The ioduretted plate is now placed in the dark chamber of the camera, and the focus being properly adjusted, it is exposed to the agency which is to impress upon it the required images. The length of time, necessary for the production of the best effect, varies with the state of the Light, the kind of image to be copied, the condition of the plate, and other things, which can only be arrived at by experience. In general, where the plate is prepared, as directed by Daguerre, with the iodine alone, about five minutes is required, in ordinary sunshine, to copy any architectural pile ; but a much less time is often sufficient.

The plate being removed from the camera in the dark, no image should be visible upon it. A change has taken place ; but as the color of the plate is not altered, that change cannot be seen. If the plate in any part is browned by too long an exposure, the lights of the picture are injured. To develop the hidden picture, the plate is placed in a box, at the bottom of which is a little mercury, so arranged, that the heat of a spirit lamp may be applied, until the the temperature of the mercury is about 167 Fahr.° The lamp is then removed; and the plate, which is watched through a glass in the side of the box, by the light of a taper, allowed to remain until the picture, in all the beauty of its minute details, is perfectly brought out. It is then removed, and it has to be subjected to the operation of fixing, or of rendering the plate of metal insensible to any further solar agency.

In forming a Daguerreotype image, it is not absolutely necessary to heat the mercury. Faraday proved that mercury was volatilised at common temperatures ; and Moser has pointed out, that if the Daguerreotype plate, after it is taken from the camera, is placed over a vessel of cold mercury for some hours, the image will be brought out in the same manner as if the mercury had been warmed. Moser has likewise shown, that if the mercurial vapor is raised to a temperature between 250° and 300° Fahr., the Daguerreotype picture becomes fixed and may be strongly rubbed. "It loses a little of its intensity at first, but not afterwards. The images, however, cannot generally resist rubbing with moist materials, as with polishing substances." It is not necessary to have recourse to the ordinary methods for removing the iodine from these fixed pictures, as it can be rubbed off.

Fixing may be effected in several ways, all of which depend upon the removal of the iodine from the plate. A strong solution of common salt will do this; but if the plate is placed in such a solution, and then touched with a rod of zinc, the removal is much more rapidly and effectually accomplished. By far the best plan, however, appears to be that recommended by Daguerre, in the first instance. The plate is first placed in clean cold water, and then into a solution of the hyposulphite of soda, in which it is moved to and fro, until all the yellow color is completely gone. It is then removed, placed in an inclined position, and boiled rain water, cooled so as to be just warm, poured over the plate in a continuous stream. Any drops of water which may remain on the plate must be removed by forcibly blowing over it. The process is now completed, as far as preventing the further action of Light is concerned. The picture is formed of the fine dust of mercury deposited over those parts on which the Light has acted, the thickness of the vapor agreeing exactly with the intensity of the Light which has fallen on the different parts of the picture ; the shadows being represented by the high black polished face of the silver.

This picture can of course be immediately destroyed by a touch, it is therefore necessary to protect it at once, by a glass or some other means. Berard, Fizeau, and others, have recommended the use of the chloride of gold, for the purpose of giving adhesion to the mercurial deposit. It is thus applied, according to the method recommended by M. Fizeau, and which appears to have been the most successful of any of the plans which have been adopted. A double salt of hyposulphite of soda and

gold is formed, by mixing very dilute solutions of the respective salts. After the iodine has been removed, as before directed, the plate is placed in an iron frame, and a sufficient quantity of the salt of gold to cover the plate, poured over it. It is then heated by a spirit lamp for a minute, or until the impression acquires the greatest strength. The liquid is then poured off, the plate well washed and dried. Gold is deposited over the plate, and thus the picture rendered less liable to injury.

Dr. Berres of Vienna states that considerable success has attended his plan, which consists in exposing the plate for a few minutes to nitric acid vapor, and then placing it in nitric acid, at $61\frac{1}{4}°$ Fahrenheit, in which a considerable quantity of silver and copper is dissolved. Shortly after being placed therein, a precipitate of metal is formed over the photograph. It is then removed, and the plate polished with chalk or magnesia, until the picture can be clearly seen. The power of multiplying these very beautiful productions is much to be desired. Several plans have been proposed, and used by the inventors, with certain degree of success, particularly Professor Groves' method of etching by electrical agency. All of them, however, are of great uncertainty; and even with the most careful manipulation, a successful result cannot be depended on. It does not form a part of the plan of the present work to embrace these matters, though they are of the highest interest to every one who is concerned in the success of photographic publication. It must, however, be acknowledged, that the only successful method of multiplying original photographic designs, appears to be the use of processes on paper, or some more transparent material, which giving negative pictures in the first instance will afford positive copies.

The Daguerreotype process has been greatly improved; and in the hands of Claudet, and others in England and America, a degree of sensibility secured, upon the silver surface, which it appears almost impossible to surpass. This is effected by exposing the plate, after the process of iodization, to the influence of chlorine or bromine, very much diluted with common air, or by using either the chloride of iodine or the bromide of iodine. The unstable character of these compounds is well known; and on the facility with which these agents are decomposed, depends the increased sensibility of the Daguerreotype plates prepared with them.

Fizeau has recommended the use of bromine water for the purpose of improving the sensitiveness of the iodized plates. This is prepared by shaking together in a bottle some bromine and water, care being taken that the bromine appears in excess. One part of this bromine liquor is united with thirty or forty parts of water, and being poured into a square shallow vessel covered with a glass, the iodized plate is exposed to its action for a few seconds during which it passes from its yellow color into a rose hue, which is the most sensitive coating yet discovered. A preparation known by the name of the Hungarian mixture, has been rather extensively sold in Paris for the purpose of giving sensitiveness to the plates, which it does with a considerable degree of certainty.

As long back as 1841, it was announced that M. Daguerre had discovered a process by which an instantaneous effect was produced; and in a communication with which the author was favored from Daguerre himself he states, "*By means of that new process it shall be possible to fix the images of objects in motion, such as public ceremonies, market-places covered with people, cattle,*" &c. But, up to the present time, some great obstacle appears to have interfered with the successful practical use of this new and important discovery. It has been stated, and apparently on satisfactory evidence, that elictricity is the agent employed to assist the operations of Light in bringing about the required change.

The expense of metallic plates and their inconvenience, particularly to travellers, renders it very desirable that some material, such as paper, might be employed instead of them. Some very tolerable effects have been produced upon silvered paper; but the pictures thus formed, want the fine black surface, which is to contrast with the mercurial vapor, and which forms the chief charm of a good Daguerreotype. In the Philosophical Transactions, Part II., for 1840, is a paper, by the author, "*On the Influence of Iodine in rendering several Argentine Compounds spread on Paper sensitive to Light.*" As many of the re-

sults are of considerable importance, particularly as they bear upon some of the opinions which we shall have to examine, I shall briefly mention such facts as appear necessary to the complete elucidation of this very interesting subject.

Any of the ordinary photographic papers, will darken by exposure to a brown or dark olive color. Exposed to the vapor of iodine, the paper becomes of a steel blue or violet color. If subjected to solar influence in this state, mercurial vapor attacks all the parts on which the Light has acted, in the same manner as it does the iodized metallic plate, giving a tolerable picture. I also found, that perfectly pure oxide of silver, spread on paper and iodized, was similarly disposed to receive the mercurial vapor, after it had been submitted to the sun's rays. The yellow-brown phosphate of silver, was also found to acquire additional sensitiveness under the influence of iodine, and to yield a tolerable picture when exposed to the mercurial fumes.

Papers which were prepared, by first saturating them, with strong solutions of the nitrate of silver, and then exposure to phosphuretted hydrogen gas, until there was a complete revival of the silver over the surface of the paper, were found to be acted upon by iodine, in a similar way to the silver plates themselves, and for most purposes are capable of being substituted for them. The pictures, when the papers are well prepared, are formed as readily as upon the iodized plates, and are not at all wanting in the beauty of their general effect, or in the delicacy of their minute detail. It unfortunately happens that a considerable degree of risk attends the preparation of the paper by this spontaneously inflammable gas.

Papers prepared in a similar way, substituting the sulphuretted for the phosphuretted hydrogen, are in nearly all respects equal to them. Some difficulties attend the preparation, but, by observing the following directions, papers of a very uniform dark grey surface may be prepared. The paper is first soaked in a solution of the muriate of ammonia, carefully wiped with cotton cloths and then dried. It is next dipped in a solution of nitrate of silver, dried in the dark, and then carried into a vessel in which sulphuretted hydrogen is slowly forming. When it has darkened to an iron brown, the paper must be passed through water slightly impregnated with chlorine or muriatic acid, and again dried. It is once more dipped into an argentine solution, and when dry, subjected a second time to sulphuration. These papers are best iodized by drawing them slowly over a saturated solution of any hydriodic salt, in which is dissolved a considerable quantity of iodine; care must be taken that one side only of the paper is wetted. It is then dried near the fire, and subjected in the camera to the solar agency. After mercurialization, the picture is fixed most effectually by a strong solution of common salt used moderately warm.

If when these drawings are finished, they are placed in a solution of corrosive sublimate, the images entirely disappear, but after a few minutes they are seen, as if by magic, unfolding themselves and gradually becoming far more beautiful than before—delicate lines, at first invisible or barely seen, are now distinctly marked, and a rare and singular perfection of detail is given to the photograph. A similar obliteration is described before; but, in this case the results are very different, the picture being again restored by the agent which caused it to disappear. It would appear that the mercury on the paper, is slowly converted into a protochloride; the *modus operandi* is not, however, quite evident.

From the great interest which attaches to the discovery of Daguerre, we must now endeavor to examine some of the most remarkable points in the phenomena, which are afforded in pursuing his photographic practice. If we expose a prepared plate for a considerable time, to the action of Light in the camera, it is darkened, and a *negative* picture results. The discovery of Daguerre, is, that, before the negative image is formed so as to be visible, the ioduret of silver has undergone a change, which has given it the property of condensing over well-defined spaces the vapors of mercury. It has been shown by M. E. Becquérel, that if the plate be removed from the influence of Light in the camera, before it has been exposed sufficiently long to afford, with the mercurial vapor, any picture, or at least anything beyond the faintest outline of a design, the process may be carried on, by exposing the plate to Light under a *red glass*, until it is fitted

for the production of a perfect positive picture by the vapors of mercury, or until by prolonged exposure a decided negative photograph comes up. E. Becquérel assumes, from these results, that there exists two order of rays, which have not been previously described, and which he calls

Rayons excitateurs, and
Rayons continuators.

These conclusions, it appears to me, have been come to by Becquérel, and discussed by Moser, without that philosophic deliberation which should always distinguish such inquiries. It will be found that the processs supposed to be carried on by the *rayons continuators*, considering them as a new class, is due to the calorific rays, and it will be found that very nearly the same effect is produced, by the application of artificial heat to the under surface of the plate. But it is not entirely to the calorific rays that the effect is due. We know, as will presently be seen, that the least refrangible rays of the prismatic spectrum, are not without some chemical power, and that is a power quite independent of their heating effect; and it will be found, with nearly all the sensitive preparations, that the action, under any circumstances of Light, is carried on much more rapidly upon those parts over which, either by Light or heat, a chemical disturbance has been already begun, than over the other parts. Moser, indeed, admits that some blue and violet rays penetrated the red glasses he used in his experiments, therefore the only effect which, as I conceive it, the red medium produced, was to retard the change, over the undisturbed parts of the plate, whilst a sufficient quantity of the most refrangible, and extra spectral chemical rays, had passed the glass, to continue the change which had been already begun. Yellow glasses were found by Moser to produce, first negative and then positive images; but "*these positive images have always a blackish covering.*" Now this is as easily explained as the action of the red glass. The change is carried on "*by the large quantity of white light*" which these yellow glasses allowed to pass, with much greater rapidity over the parts on which the Light has already acted, than on the others; but even these were gradually changed. Any one conversant with the ordinary photographic processes, must have observed, that when the maximum point of darkening has been arrived at, a peculiar olive tinge, gradually comes on*, and the picture being now a fine brown color on an olive ground may be considered a positive one.

What is the nature of the change which the ioduret of silver undergoes on these Daguerreotype plates? This question has been often asked, and answered in various ways. Draper†, from an experiment in which he placed a paper saturated with starch, on an ioduretted plate, and which, after exposure, gave no evidence of the formation of the iodide of starch, from the liberation of the iodine, infers that no decomposition of the sensitive surface has taken place. Moser contends, that "the action of Light does not necessarily consist in the separation of two chemically combined bodies." He appears to attribute the alteration of color, to an isomeric change in the iodide of silver. In a paper published in the Philosophical Magazine, April, 1840, I stated it as my opinion that there were two iodides of silver, one speedily darkening, and the other unalterable by Light. The results of my observations, since that period, lead me to view the matter differently, and I regard the action of Light on this salt, as a very evident case of decomposition. I have, in a more recent paper in the same journal‡, drawn attention to some instances of decomposition, apparently similar to those produced by Light, and indeed regarded by Moser as the effects of "*invisible light*," but which can be very clearly traced, to the disturbance of the caloric, latent in the bodies operated on. I refer to this, only in proof of the position that the *blackened iodide* is indeed silver, from which the iodine has been set free, in a state of very fine division, and partial oxidation. As these phenomena will form the subject of a separate chapter, I shall not do more than refer to them in this place.

It will be found, if we allow one part of a sensitive plate to blacken, whilst the other

* Moser says, "I exposed iodized plates to daylight, and whenever possible to strong sunlight. *The plates became first black, then lighter, and lastly greenish.*"

† Philos. Mag., Sept., 1841.

‡ On the Changes which Bodies are capable of undergoing in Darkness, &c., April 1843.

portion is protected from the Light, that the dark part is very easily removed by rubbing with the hand, whilst the unchanged division, resists any such mechanical means of removal. In the very fine powder thus rubbed from the silver, I have never been enabled to detect any iodine, but it comports itself, in all respects, like the oxide of silver and the finely divided metal. A fact mentioned by Moser—viz. that he has been enabled to remove film after film of the sensitive surface, and yet had a surface which was still sensitive to Light, which he considers conclusive in favor of his argument, that the combination of silver and iodine is not decomposed—appears to me to prove nothing. The iodine may attack the plate to a considerably greater depth than we imagine ; and hence, although we may remove eight surfaces, we may still have a sensitive surface left, or, as I am inclined to believe, the iodine being liberated, from the most superficial film, attacks immediately the one below it. The powerful affinity of this element for the metals, will countenance this opinion, and it will account for the failure of Dr. Draper to produce the iodide of starch in his experiment. It has been shown by M. Lerebour, that the presence of the smallest quantity of iodine vapor in the camera is quite sufficient to prevent the formation of any image; and he distinctly states that he has failed to produce a picture, during the whole of a long summer day, owing to his having kept his iodizing box and camera together, by which the latter received a little of the vapor of this subtle elementary body. Ammonia dissolves off from the plate the darkened portion, whilst a solution of the muriate of soda, or of the hyposulphite of soda, removes the unchanged ioduret. These facts certainly support the view, that decomposition has taken place on the sensitive surface, that the iodine has been liberated by the action of the solar rays, and that this change fits parts of the plate for the condensation of the mercurial vapor. There are some facts, however, curiously connected with this action of vapors, which will hereafter claim our attention.

Prismatic Analysis.—In the Philosophical Magazine for April, 1840, the author published an account of the effects produced by the spectrum on a Daguerreotype plate. The experiment has been repeatedly tried, and the results have been the same, if we except a little shifting of the point of maximum action—a subject on which more will be said hereafter. The most refrangible portion of the spectrum, appears, after the plate has been exposed to the vapor of mercury, to have impressed its color; the light and delicate film of mercury which covers that portion, assuming a fine blue tint about the central parts, which are gradually shaded off into a pale grey; and this is again surrounded by a very delicate rose hue, which is lost in a band of pure white. Beyond this, a protecting influence is powerfully exerted; and, notwithstanding the action of the dispersed light, which is very evident over the plate, a line is left, perfectly free from mercurial vapor, and which, consequently, when viewed by a side light, appears quite dark. The green rays are represented by a line of a corresponding tint, considerably less in size than the luminous green rays. The yellow rays appear to be without action, or to act negatively, the space upon which they fell being protected from the mercurial vapor ; and it consequently is seen as a dark band. A white line of vapor; marks the place of the orange rays. The red rays affect the sensitive surface in a peculiar manner; and we have the mercurial vapor, assuming a molecular arrangement which gives to it a fine rose hue ; this tint is surrounded by a line of white vapor, shaded at the lowest extremity with a very soft green. Over the space occupied by the extreme red rays, a protecting influence is again exerted ; the space is retained free from mercurial vapor, and the band is found to surround the whole of the least refrangible rays, and to unite itself with the band which surrounds the rays of greatest refrangibility. This band is not equally well defined throughout its whole extent. It is most evident from the extreme red to the the green ; it fades in passing through the blue, and increases again, as it leaves the indigo, until beyond the invisible chemical rays it is nearly as strong, as it is at the calorific end of the spectrum. By lightly rubbing a Daguerreotype picture of the prismatic rays, it is obliterated, except over the spaces corresponding with the yellow and red rays. In November, 1842,

Dr. Draper forwarded to Sir John Herschel, a specimen of a Daguerreotyped impression of the solar spectrum, obtained by him in the south of Virginia ; and in the Philosophical Magazine for February, 1843, Sir John Herschel published an account of his examination of it. In its principal features, this spectrum corresponds with those I have obtained ; and I am inclined to attribute the variations which do exist, not merely to a difference in the Light of the sun, but also to some peculiarities in the prisims employed. I am quite inclined, with Dr. Draper, to believe that spectra obtained near to, or at a distance from the equator, will be found to vary considerably ; and it is only on the strength of this opinion, that I am at all enabled to reconcile the somewhat contradictory results of our experiments. The principal difference which is to be observed between Dr. Draper's spectrum on the Daguerreotype plate, and that which I have described, consists in the remarkable distinctness of the compartments, which are found between the space occupied by the yellow ray and the most refrangible portion of the spectrum. The same protected spaces are observed at the top and bottom of the spectrum ; but there is no appearance of the same influence at the sides of the spectral image. Sir John Herschel has shown that the tints observed on this spectral image, are the Newtonian series of colors of the first order of the reflected rings ; modified, however, in its first stages, by a cause which seems to have shifted the initial black of that series to a higher point in the scale of thicknesses of the producing film, or to have displaced the whole series by the intrusion of a white commencement. For the Newtonian reflected tints of the first order are black ; very feeble and hardly perceptible blue ; brilliant white ; yellow ; orange, at which point the series breaks off. (*Herschel.*)

It will not be improper to mention here, that when copper, plated with silver cannot be procured, very tolerable results may be obtained, by using plates of copper silvered, with the ordinary silvering compound of chloride of silver, common salt and cream of tartar. The copper being brought to a perfect polish, is well washed with salt and water ; a little of the silvering compound is briskly rubbed over the plate, until it presents a uniform coating of white silver ; the plate is immediately washed in clean salt and water, and dried near the fire, by carefully rubbing it with very clean cloths. I have found that the polish of this silvering is much improved by passing the plate through a very weak solution of iodine in water. A thin film of ioduret of silver is thus formed. It is then exposed to sunshine, and afterwards rubbed with a clean leather and a little fine prepared chalk, by which the iodized surface is removed, and a beautifully polished face left to operate on. It is then iodized, and used in the same manner as the plated copper tablets.

Some very curious results have been obtained by operating on silvered plates, with iodine in various ways. A silvered plate, with some leaves placed upon it and pressed close with a glass, was immersed in a solution of iodine in water, and in this state exposed to the Light. An ioduret of silver was rapidly formed, and blackened ; this blackened coating was dissolved off, and another formed. Thus successive layers of the salt were formed and removed, until at the expiration of an hour, all the silver was gone from the exposed parts of the plate. Upon removing the leaves it was found that a most beautiful impression of them was made on the copper, and they were of a rich green color.

A piece of glass was covered with silver leaf, and treated in the same way as the silvered copper. The metal was dissolved from the exposed parts, and a very perfect silver leaf left upon the glass.

It may be worthy of observation, that the image on the Daguerreotype plates may be completely obliterated by rubbing, but it may be again restored, by placing it in a tolerably strong solution of iodine in water. I have often found, that the parts over which the mercury has not been deposited, are deeply etched by the solution of iodine, and it does appear that with some attention, a very important practical advantage may be taken of this remarkable peculiarity. The great difficulty lies in overcoming the spots which are formed by definite spaces in the metal, which are in different electrical conditions, from the other parts. These form so many points of action, and give rise to circles, which rapidly spread and obliterate the design. I have not much doubt but we might, by

adopting Mr. Groves's method of etching these plates by the influence of an acid and a powerful voltaic current, produce some very pleasing results.

After exposure to Light, a well-prepared Daguerreotype plate was placed in a vessel, in which chlorine was very slowly forming, from manganese and muriatic acid. In a short time the iodized surface which had not been exposed sufficiently long to undergo any change of color, became perfectly black. In this state it was subjected to Light; the effect of which was to whiten the plate with much rapidity. The author's engagements have not allowed of his following out this discovery; but it has in two or three trials which he has made, produced very tolerable positive pictures by the first process, without mercurialization.

Bromide of Silver.—This salt, like the iodide, does not appear to be very readily changed by the solar rays, when it is perfectly pure. The slightest admixture of the nitrate of silver, renders it very susceptible of change, and under certain conditions it becomes the most sensitive of the photographic preparations. M. Biot has expressed it as his opinion, that it is not possible to find any substance more sensitive to Light than the bromide of silver This opinion must, however, be qualified by the above conditions. Sir John Herschel has used films of this salt precipitated upon glass plates, which, when dry, are washed over with a solution of the nitrate, with the greatest advantage, in the camera obscura. It must, however, be observed, with regard to this, and other salts, which are stated to be unchanged in their pure state, that this applies only to a visible change. We have distinct evidence that a moment's exposure of the pure bromide of silver to the sun's rays is quite sufficient to produce a change, which may be rendered visible by subsequent applications.

Prismatic Analysis.—As soon as the prismatic spectrum falls upon paper, prepared with this salt, it blackens over the whole extent of action with nearly equal intensity. As far as I have been able to detect it, which it is difficult to do, from the rapidity of the action, the maximum effect is produced somewhere about the indigo ray. My own results correspond exactly with those obtained by Sir John Herschel, who says, "But the most characteristic peculiarity of the spectrum is its extravagant length. Instead of terminating at the fiducial point (the mean yellow ray) or thereabouts, the darkened portion extends down to the very extremity of the visible red rays. In tint it is pretty uniform (a grey black, not by any means intense) over the whole length, except that a slight fringe of redness (but no green or blue) is perceptible at the least refracted end." The author, has, however, found that the grey-black may be very much darkened by allowing the nitrate of silver to be pretty much in excess; and by using a very faint spectrum he has sometimes got decided evidences of natural coloration. Below the red ray an extended space is protected from the agency of the dispersed light, and its whiteness maintained; thus confirming the evidence of some chemical power in action, over a space beyond the luminous spectrum which corresponds with the rays of the least refrangibility.

Photographic Application.—If a paper is first washed with a solution of the nitrate of silver (100 grains to an ounce of water), and when dry with a solution of 20 grains of the bromide of potassium in four drachms of water, and the silver solution again applied, a paper of exquisite sensibility results, and it may be used with advantage in the camera obscura. These papers turn brown in the dark, by which their susceptibility to change by Light is much lessened.

In 1841, I published a process, which I then considered as quite new, by which pictures were produced on bromidated papers, after an exposure of an exceedingly short duration. This process had, I have since found, been previously pointed out by M. Bayard: of this I was, until long after, quite ignorant. Although there are some objections to the process, it is so very interesting, as giving evidence of the rapidity with which a faint gleam of Light will effect a change of state, that it cannot be well omitted in this place.

Paper is prepared with bromide of potassium and nitrate of silver, in such proportions that the nitrate is in very slight excess. When used, it is washed over with a solution of 120 grains of nitrate of silver,

and placed wet in the camera. After being exposed for a second or two, the Light must be shut off, the camera carried into a dark room, and the paper allowed to dry in the dark. When dry, it is placed in the mercurial vapor box; and heat being applied, the mercury is very slowly vaporised. The picture now begins to develop itself, and gradually a most intense negative photograph results. It often happens that the pictures appear at at first clouded; but if the paper is placed in the dark, it generally in the course of a few hours gets clear. I have often procured most beautiful pictures by this method, after an exposure to solar influence during a a second; and moving objects have been well defined, showing the action to be almost instantaneous. Photographs thus procured are best fixed by soaking the paper in a weak solution of salt in water, and then by brushing the paper over with the hyposulphite of soda. The great difficulty to be overcome in this process, is the annoyance continually arising, from the perfect blackness produced over every part of the paper by the mercurial vapor. Often, when the best result appears to have been attained, in an instant the delightful picture vanishes away, and a sheet of blank blackness takes its place. It is not quite clear to what this can be attributed; some kinds of paper are more liable to it than others, from which it would appear that it arises from the condition of the surface. I have indeed, on some occasions been enabled to trace this blackening, from a little downy pile standing out more prominently from one part than from another. My attention has been carried away by the scientific interest which attaches to the inquiry, and I have not allowed myself to be detained, by the intricacies which I have found connected with those manipulatory details, necessary for the perfection of many of the processes described, and, amongst others, the one now mentioned. I have no doubt, however, that very beautiful effects might be relied on, if a little attention was given to a preliminary process, by which a perfectly uniform surface might be ensured. Certainly this process promises a degree of susceptibility, which no other, with which we are acquainted, seems likely to realize.

I have already mentioned, that the bromide of silver may be used very advantageously with the gallic acid for the production of pictures. I am inclined, under all circumstances, to regard the bromide as preferable to the iodide of silver. Certain it is that if we use these salts alone, or in a pure state, the bromide has an advantage over the iodide. It will be found that papers prepared with a single wash of each of the following solutions—

Bromide of potassium 50 grains, water 1 oz.
Nitrate of silver 100 ditto—

may be used most advantageously for copying any fixed objects. They require but a few minutes' exposure, and at any time the picture may be brought out, by washing with the solution of gallic acid. These photographs, which possess all the requisites of good negative ones, may be well fixed, by washing with a weak solution of the bromide of potassium, or with the hyposulphite of soda.

If a paper is covered with a perfectly pure bromide of silver, it will, when washed over with a solution of the ferrocyanate of potash, exhibit an increased degree of sensitiveness to solar agency; but the resulting picture, falls very short of that blackness which we get by using the iodide of silver, the darkest parts never becoming deeper, than a full grey or lead color.

Prismatic Analysis.—If a bromidated paper, whilst under the influence of the spectrum, is washed with the ferrocyanate of potash, it begins to darken instantly over the violet rays, which darkening action extends down to the end of the visible red ray, some slight interference being observable about the region occupied by the yellow and orange rays. Then a bleaching action begins, over the space on which the red rays fall, which slowly extends up to the green: by a long-continued action, an oval spot begins again to darken, about the centre of the bleached space. In this case, as in that with the iodide of silver, if a second wash of the hydriodate of potash is applied, the bleaching action is extended over the region of the most rafrangible rays, and considerably beyond them. We observe again in this instance, the negative action of the extreme red rays, which has been previously described.

Fluoride of Silver.—The combinations of fluoric acid and silver have not been previously examined. Sir John Herschel, indeed, suggested some experiments on glass plates of a very interesting de-

scription, but I am not acquainted with any published account of the results. Paper washed with fluate of soda, and then with nitrate of silver, is not more sensitive to Light than the nitrate itself, but it eventually becomes much darker.

Prismatic Analysis.—A paper was washed first with nitrate of silver, and then with the fluate of soda. Under the spectrum the action commenced at the centre of the yellow ray, and rapidly proceeded upwards, arriving at its maximum in the blue ray. To the end of the indigo the action was pretty uniform ; it then appeared to be very suddenly checked, and a brown tint was produced under the violet rays, all action ceasing a few lines beyond the luminous spectrum. Some faint indications of change were evident to the lowest edge of the yellow, but none whatever below that point. The colors of this spectrum are not a little remarkable. I have now before me a spectrum impressed two months since, and the colors are still beautifully clear and distinct. The paper is slightly browned by diffused light, upon which appears the following order of colors. A yellow line distinctly marks the space occupied by the yellow ray, and a green band the space of the green ; through the blue and indigo region the color is an intense blue, and over the violet a ruddy brown.

The fluates of soda and of potash have been used in many different manners, and variously combined. It has been found that the fluate of soda has the property of quickening the sensibility of bromidated papers to a very remarkable extent ; and from this quality a new process, which I would distinguish by the name of the Fluorotype, results.

The Fluorotype.—This process, which is characterised by its easy manipulation, and by the sensibility of the papers when carefully prepared, consists in the formation of a salt of silver, which I suppose must be considered a fluo-bromide of silver. It is at present somewhat difficult to say, which is the most efficacious manner of proceeding ; but the difference as it regards the sensibility of papers, is so very trifling that this is not of much consequence. The paper may be washed first, with the bromide of potassium, and then with the fluate of soda ; or, which will be found on the whole the best plan, the two salts may be united. The strength of the solutions should be as follows :

Bromide of potassium,	20 grains.
Distilled water,	1 fluid ounce.
Fluate of soda,	5 grains.
Distilled water,	1 fluid ounce.

Mix a small quantity of these solutions together, when the papers are to be prepared, and wash the paper once over with the mixture, and when dry, apply nitrate of silver, in solution, 60 grains to an ounce of water. These papers appear to keep for some weeks without injury, and they become impressed with good images in half a minute in the camera. This impression is not sufficiently strong to serve, in the state in which it is taken from the camera, for producing positive pictures, but it may be rendered so, by a secondary process.

The photograph is first soaked in water for a few minutes ; it is then placed upon a slab of porcelain or stone, and a weak solution of the protosulphate of iron applied, which very readily darkens, all the parts on which the light has acted, to a deep brown, and every object is brought out with great sharpnesss. When the best effect is produced the process must be stopped or the lights suffer. All that is necessary is to soak the paper in water, and then fix the drawing with hyposulphite of soda. This process admits of numerous modifications.

Phosphate of Silver was first suggested as a good photographic material by Dr. Fyfe, who recommends that the paper should be soaked in a solution of phosphate of soda, and then dried ; after which the nitrate of silver is spread over one side of the paper by a brush ; the paper is again dried ; and afterwards put through the phosphate, by which any excess of nitrate of silver, is converted into a phosphate. Although papers thus prepared answer exceedingly well, for copying by application, they do not change so readily as to render them of any use in the camera obscura. One advantage possessed by these phosphated papers, is the readiness with which they are fixed by the application of a weak solution of ammonia. The yellow phosphate of silver is quite soluble in ammonia, and we are thus enabled to remove it very readily, without doing much injury to the darkened parts of the paper. Dr. Fyfe

recommended the application of the precipitated phosphate to paper, glass, or metal in the form of a paint; and if this is carefully done, some very pleasing effects are to be produced. After the phosphate has been darkened by exposure to sunshine, it is very readily bleached by the joint agency of the solar rays and the hydriodate of potash. This was the process published by Dr. Fyfe, for producing positive photographs by one application, at a very early period; other processes were found, however, to give much more satisfactory results, and it is now but seldom used.

Prismatic Analysis.—The spectral image formed on the phosphate, does not present anything very remarkable. The maximum point is situated in the mean blue ray; the chemical disturbance is carried on actively over the indigo, and with some energy in the violet rays, and to a considerable distance beyond the visible spectrum. It extends downwards, nearly to the centre of the yellow ray: about this region the image has a decided green shade. A space without any visible change here presents itself, but over the region occupied by the red rays, the phosphate assumes a brick-red color. A precipitate consisting of phosphate of lime, combined with organic matter, common salt, and nitrate of silver was used by Sir John Herschel, and the spectral image formed, appears very nearly to have resembled that just described. Some very trifling differences are observed; but these are merely the shifting of the points of maximum effect which are constantly varying with the dose of the ingredients.

THE DIFFICULTIES OF THE ART.

BY THE EDITOR.

In our first number, we endeavored to show that the difficulties arising from the supposed imperfections of plates, were more or less attributable, in a majority of cases, to other causes. Of this we are more and more convinced every day. Situated as we are, we have opportunities for hearing the ocmplaints on this subject in their broadest and fulleset xtent, as well as the means of canvassnig them thoroughly, and ascertaining how far actual facts and experiments will go to prove the validity of each; and from facts which have come to our knowledge since our first article was written, we are convinced that we have no reason to retract one word of that article. We could relate anecdotes without number, would it not put to the blush some of our best friends, that would convince all reasonable men of the accuracy and soundness of our statements.

We cannot, however, expect to bring all into our views; for experience has taught, us that no matter how strong the proofs, a man convinced, "against his will, will be of the same opinion still." We can sympathise with that class, for we have often felt how difficult it was to relinquish an opinion or sentiment long cherished and firmly impressed. We have never, however, found it detrimental to our character or interests when we have yielded to well established truths, and we think we could point out not a few in the Daguerreotype profession, who might, by looking a little deeper into causes, and judging them by their effects, acknowledge the same.

In regard to the view we have taken, relative to daguerreotype plates, we would simply say, that they have been formed after nearly four years intimate acquaintance with the various kinds and brands sold in the New York market. We know of no brand from the guarantee 20th and 30th to the poor miserable star 60th—too often imported and imposed upon operators by men of loose principles for 40th—that have not come under the ban of disapprobation. We could mention hundreds of instances where plates which have been

condemned by one artist, on some one of the grounds of complaint alluded to in our first article, have by others been pronounced most excellent.

Instances have occurred where whole plates have been cut up, after being carefully selected, and distributed among artists proverbial for their complaints—taken too, from the same importation, out of which hundreds had been sold too, and no fault found, by some of the best artists in the country, and pronounced by some the most worthless plates ever used and excellent by others.

We can go still further, and say that we know of instances where plates have been cleaned, and exhibited to the vender with pictures upon them, marred by either copper or black spots, which have been taken by another operator, recleaned, and submitted to the light in the camera, and again exhibited free from those imperfections.

When operators can explain these simple facts, and many more like them, to the prejudice of the plate, we will, without hesitation, yield to them the palm. We do not, however, wish to be understood to say, that plates are all perfect—it would be a declaration on our part too broad to be sustained, and too derogatory to the judgment of others equally competent to judge—but that they are condemned, in nine cases out of ten, most unjustly, and when the fault lies entirely with the operator himself.

Before we dismiss the subject entirely, we would caution our readers as to the purchase of their plates. It is a well known fact, that thousands of plates are brought into the United States from France, by persons of narrow judgment, marked and sold for 40ths, when, in fact, they contain but one part in sixty, and one in eighty of silver. They are generally introduced by small importing houses, not in the daguerreotype stock business, and who think and care more for making an extra profit than for their reputation, and as the plates invariably pass through several hands before they reach those of the consumer, they are, in a measure, shielded from the odium attached to such cupidity; but it falls heavily upon the unsuspecting dealers who buy of them. The safest and surest way is for the operator to make his purchases of those dealers in daguerreotype stock who make their own importations, and whose characters, for honesty and probity, are above reproach.

We will now proceed to other branches of our subject equally claiming our attention.

There is no subject more incomprehensible to most artists than the difficulties occasioned by the variations of Light—variations which occur in almost all climates, but in none more than our own temperate zone, although decidedly the best for photographic purposes. As we go farther south, towards the equator, the difficulty of taking photographic impressions becomes more difficult, until we reach the torrid zone, in some parts of which, it is impossible to produce an image at all.

As we stated in our first article on this subject, it is now well understood that there are two principles in solar light—photographically speaking, termed, by philosophers, photographic and non-photographic, and the success in photographic manipulation depends upon the prevalence of the first.

It has been thought that the calorific and chemical rays of light only were necessary to the production of pictures, but from experiments, to which we have turned our attention for the past two years, we are convinced that the calorific rays are equally necessary.

The photographic principle of light, therefore, consists of the calorific, chemical, blue and white rays; the prevalence of red or yellow rays, or any of their compounds being decidedly opposed to the process. The rapidity and excellence of the manipulation must consequently be in proportion to the presence or absence of the latter colored rays. As they are more apt to exist under a burning sun, we can account for the ill success that has attended every effort to obtain photographic pictures in Yucatan and Central America; and for the necessity of shielding our skylights, even in the northern parts of the United States, by screens, from the direct rays of the sun during the summer solstice, and, in fact, during the warmer days of winter.

Even on bright, clear days, when the atmosphere, generally, is entirely free from the influence of this photographic destroy-

ing medium, the reflection from any bright red, or yellow object near, will produce the same effect if allowed to penetrate the operating room. Those who pay attention to these influences, and take measures to avoid them, operate with much more certainty, and will always command a greater amount of business than those who neglect them.

It seems strange to us that our artists are so slow in comprehending what is of such importance, and of such intrinsic value to them, for we find very few who do not look upon us as somewhat visionary when we state these facts to them.

To obviate the difficulty produced by the occasional superabundance of red and yellow rays of light, we have, for the last three years, recommended the employment of blue glass as a media through which to pass the light into the operating room, and Mr. Claudet, of London, has demonstrated, by actual experiment, that the plan is perfectly feasible.

By our advice Mr. Brady, of New York, made the experiment, and was convinced of its practicability, and that, although it made the room appear much darker, there was no perceptible difference in the time.

The expense, however, of a sky-light of blue glass being a serious objection to daguerreotypists—although it should notbe—we turned our attention to the discovery of some means by which all its benefits, without its expense, might be secured, and we, in a very short time, accomplished our purpose.

Taking a piece of blue glass, we cut it round, the exact size of the cap-support of the camera tube, and fitted it in snugly in front of the lenses. The experiment met our most sanguine expectations. On cloudy days, the time of exposure of the plate in the camera required, was the same with as without it; and on a day when the atmosphere was somewhat hazy and yellowish not so long. This leads us to the suggestion, that manufacturers of cameras, hereafter, construct them in such a manner that the blue glass may have proper support in its place when an artist is desirous of using it. Or it may be attached to the camera and sold with it.

Another difficulty encountered in the art, and which is felt more by the sitter than the operator, but has more influence on his prosperity than he is generally aware, is the frequent contortions, and apparent caricatures of the sitter, produced upon the plate.

This we conceive to be owing to three causes:—Imperfect lens, a tendency of some interposing media to refract the rays of light, and the want of proper attention upon the part of the artist as to the position of the sitter, and to the expression of the face.

If the lenses of the camera are not perfect, if they converge or diverge too much, they will contract or enlarge the features; and if their surfaces are not perfectly even, they will naturally produce images in which the lines of the face are more or less bent out of their right position. Defects of this kind may be detected by viewing an image on the ground glass of the camera you wish to purchase, and comparing it with lenses that are known to be perfect. This is the more necessary when the artist is not well versed in the principles of drawing, and cannot, by his own judgement, decide as to the correctness of the drawing on the ground glass.

On the subject of position, we shall touch lightly, as we intend to devote a considerable portion of our journal to it, under its proper head.

That it deserves more attention than it receives from our Daguerreotypists, they would readily admit, could they listen to the conversations frequently held in social circles, on this particular branch of their business.

"Look right into the camera," is a direction often given to the sitter by the Daguerreotypist, which cannot be too highly censured; for a more palpable error, where grace and ease is desired, could not be committed.

That the position of every portion of the sitter's person should be carefully studied, may be illustrated by a single incident that came under our observation but a short time since. A gentleman had a daguerreotype of his wife taken by one of our best artists, and so far as the tone and boldness of the picture was concerned, it could have no superior—still, when it was delivered, he expressed himself dissatisfied, declaring that it had no more resemblance to his wife than to any other lady. We were appealed to to decide, and gave our opinion

as above expressed, but nothing could move his decision, although he acknowledged that he perfectly agreed with us, as to its merits in other respects, and as he could not censure the artist, he willingly took the daguerreotype, deciding to make another trial at a future day. We then explained the cause of his disappointment, and he was satisfied that the fault was with the lady, although we, in our mind, were positive it was with the artist. The fact was, she had elevated her eyebrows to such a degree, as to give her eyes a very disagreeable stare, and produce a contraction in other portions of her features.

Had the operator paid more attention to his subject, he would have studied her face more minutely, detected the defect, and watched his opportunity to secure the impression of the image, at the moment when a more pleasing expression crossed the features. This he might readily have produced by some pleasant remark, or delicate compliment.

Daguerreotyping opens a wide field of study to all those who adopt it as a profession. It is unlike nearly all the other branches of fine arts, although intimately connected with them, inasmuch as it depends in a much greater degree on the abstruse sciences, a knowledge of which must serve to assist its votaries in their labors. There is no portion of the process that does not depend upon either chemistry, natural philosophy, painting, mechanics or taste, and we can scarcely draw the line between them to point out the most important—although mechanics undoubtedly holds the lowest place, requiring little more study than is necessary to enable the artist to handle his tools and apparatus in a masterly manner.

Optics, however, is one of the most important, and a thorough knowledge of it must render invaluable aid to the daguerreotypist. It should command equal attention with chemistry. We believe that many of the difficulties now experienced by operators would be removed were they proficient in the sciences enumerated. Hundreds of dollars, now paid by the majority for receipts—some of which are got up merely for speculative purposes—would be saved to them.

Daguerreotypists never need have any apprehensions of learning too much; the more knowledge they acquire, the more they will desire. Let them remember the lines of Pope:—

> " A *little* learning is a dangerous thing,
> *Drink deep*, or touch not the Pierian spring."

The recommendation we have heard given to a daguerreotypist, who sought for advice in some of his experiments from a brother artist, " to let experiments alone, as they are rather expensive to the pockets," is truly worthy only of Goth or Vandal, but never should have been given in the nineteenth century by one who aspires to be a teacher.

Let those who have the ambition to search for new results, pursue their investigations, and, instead of endeavoring to dishearten them by false notions of economy, or utopian views of impracticability, we should encourage and assist. Experiments invariably lead to some good result; if we do not succeed in accomplishing the result for which we set out, another door may be opened more advantageous.

In fact, we should like to be informed how difficulties, in any instance, can be overcome without a knowledge of their source, and how that knowledge can be obtained without experiment? Daguerreotypists have only to read the history of the Daguerreotype art, to be convinced how much they owe to experiment.

The chemicals sometimes give rise to difficulties which are not readily overcome at the moment. Did not these difficulties occur with chemicals previously ascertained, by long use, to be good, we should be apt to attribute them to bad bromine, iodine or mercury, and although there is no doubt such is frequently the cause, other reasons must be given for the same results when the reverse is the case.

One of the causes is the neglect of the operator to keep his mercury clean. The bottle containing it, should always be kept well stopped, and the bottle securely covered. The mercury should also be frequently filtered; and should not be left in the bath until it becomes so completely oxidized, by the joint effect of heat and the atmosphere, as to loose its vitality, a circumstance quite natural under the process. Operators who procure the best mercury—and we do not think we shall be accused

of favoritism, when we recommend Dr. Chilton's as such—will find, by following the above directions, much less cause of complaint against it.

We shall not, however, in this place, enter into an analysis of the chemicals used in the Dagurrean art, as we have assigned a place for each in our journal, where they will be treated of at length. The general effect of certain causes, is all with which we have any thing to do at present.

The fact, that operators too often purchase inferior articles of mercury, bromine, iodine, hyposulphite of soda, chloride of gold, &c., because they are cheaper, under the impression that they are good enough, militates much against their claim to sound sense; and under such circumstances, they cannot be surprised if their success is equivocal. Neither of the articles named, as well as rouge and rottenstone, should be used unless of the very best quality. Now, the prices of them all are graduated according to their excellence, and for an operator to suppose that he can purchase an article for fifty or seventy-five cents, equal to that for which one dollar is charged, is, as a general rule, preposterous; particularly at this time, when every thing of the kind is down to the very lowest price at which it can be afforded.

Those who know us, are well aware with what tenacity we hold to the doctrine of home manufactures; but there are some things which oblige us to relinquish our prejudices in favor of foreign manufactures. Two of these articles are bromine and dry iodine. The German bromine and the English iodine, are certainly the best that can be procured, notwithstanding they are dearer in price, at the outset, they are actually, in use, the cheapest; for the same quantity of each will go farther and last as long again, although they are but one fourth and one third higher.

The same may be said of the French hyposulphite of soda. We have, however, advanced nearer perfection in this than in the other two.

With the chlorides of iodine and gold it is very different. In both of these articles the American manufacturer cannot be excelled; and a number of them have gained just celebrity, by the superiority of their manufactures.

We dislike to particularise in these matters, on account of the jealousies it is apt to engender, but our duty is more to the consumer than the maker, and we shall not hesitate to give the former its benefits at all hazards. Our duty must lie where it is of the most profit to the largest number, and if the minority choose to cavil at us for exercising this right, we must bear the consequences as best we can. With these reasons actuating us, we must recommend the golds of Dr. Chilton, Mr. Davie and of Mr. Burgess, as the best we know being in the market. Those who prefer making their own, will find a receipt in our first number, and two or three in the "History and Practice of the Art of Photography."

Not a few of the excentricities of the photographic chemicals may be attributed to the state of the atmosphere. At times they are, owing to the excessive heat, at others to a chilliness, imperceptible to the human form, but which acts powerfully upon the exquisite sensitive coating on the plate.

The philosophy of this will be acknowledged by all who have made observations upon the various workings of the chemicals under different aspects of the atmosphere. It has been ascertained by several—Col. Whitney, of the "Republic," being the first to discover the phenomenon—that the manipulation is best, and most perfectly conducted immediately before and after a thunder storm.

The reason of this must be apparent, as it is a well known fact, that the atmosphere is much clearer, and of a more even temperature at such times than at any other. It also argues that electrical influences tend to the more perfect development of the daguerreotype picture. These chemical changes, we think, we shall be enabled to control in a measure, by means of an invention we have recently perfected, and shall shortly bring before the daguerrean public.

In the course of this article, we have recapitulated some of the points laid down in our first. We have thought this necessary, as we are convinced that too much cannot be said upon them. They are of vital importance to the Daguerreotype manipulator, and should be indelibly impressed upon his mind.

PHOTOGENIC DRAWING MADE EASY;

A

PLAIN AND PRACTICAL INTRODUCTION TO DRAWING AND WRITING BY THE ACTION OF LIGHT.

BY N. WHITLOCK.

The wonderful discoveries said to have been made by M. Daguerre, an artist of eminence in Paris, in the art of drawing, and even painting and engraving, by the action of light on chemically prepared paper, and the interesting contemporaneous discoveries on the same subject that have been proved and explained by H. Fox Talbot, Esq., F. R. S., in the various papers read by him at the meetings of the Royal Society in January, 1839, have greatly interested the public. Mr. Talbot, with that generous desire for the extension of science which actuates every liberal mind, has made no sécret of the *substances used* in the preparation of the paper, or the *process* of his *numerous* experiments. Sir John Herschel, Dr. Golding Bird, and other gentlemen, have followed the example of Mr. Talbot in placing the result of their numerous experiments before the public; and as the most beautiful and elaborate drawings are produced with almost incredible ease and rapidity at a trifling expense, it can excite no surprise that so many persons are now employed in making experiments in this novel mode of producing pictures.

The writer of these remarks, some years ago, employed a considerable portion of time in making experiments for obtaining colors from various metals for the purpose of staining glass, and frequently observed, after floating nitrate of silver over the surface of the glass, in order to produce a yellow stain, that when dry, if exposed to the light, the silver became black; and on one occasion, having placed a printed paper over the silver when dried upon the glass, to prevent the dust falling upon it, on removing the paper some hours afterwards, the letters were clearly traced upon the silver, the letters appearing white upon a black ground. This incident is not mentioned for the purpose of making the slightest claim to the discovery of the photogenic, art, but merely to show, that if the effect of the accident had been improved, it might have led to the discovery.

Mr. Talbot thus commences his paper on photogénic drawing:—"In the spring of the year 1834, I began to put in practice a method which I had devised some time previously, for employing for purposes of utility the very curious property which has been long known to chemists to be possessed by the nitrate of silver; namely, its discoloration when exposed to the violet rays of light." This property appeared to me to be perhaps capable of useful application in the following manner. I proposed to spread on a sheet of paper a sufficient quantity of the nitrate of silver, and then set the paper in the sunshine, having first placed before it some object casting a well-defined shadow: the light acting upon it would naturally blacken it, while the parts in shadow would retain their whiteness." Mr. Talbot tried the experiment, and succeeded in producing pictures of various substances with a rapidity that greatly surprised him; but the pictures were evanescent, and disappeared after a short exposure to the light, and he in consequence tried various methods of fixing them: in this he was also successful, and he exhibited drawings of various objects, which have continued on the paper upwards of two years, with very little alteration of color.

The method of applying the silver to the paper; the exposure of the paper when the silver is spread upon it to the light, so that it may produce a representation of any object placed upon it, or before it; and the means of fixing the picture obtained, is the whole of the discovery. The process, as detailed by Mr. Talbot, is as follows:

In order to make what may be called ordinary photogenic paper, he selects, in the first place, paper of a good firm quality, and smooth surface ; and thinks, that none answers better than superfine writing paper. He dips it into a *weak* solution of common salt, and wipes it dry, by which the salt is uniformly distributed throughout its substance. He then spreads a solution of nitrate of silver on one surface only, and dries it at the fire. The solution should not be saturated, but six or eight times diluted with water. When dry, the paper is fit for use.

With regard to the second object—that of fixing the images—Mr. Talbot observes, that, after having tried *ammonia*, and several other re-agents, with very imperfect success : the first which gave him a successful result, was the iodide of potassium, much diluted with water. If a photogenic picture is washed over with this liquid, an *iodide of silver* is formed, which is absolutely unalterable by sunshine. This process requires precaution : for, if the solution is too strong, it attacks the dark parts of the picture. It is requisite, therefore, to find, by trial, the proper proportions. The fixation of the pictures in this way, with proper management, is very beautiful and lasting. The specimen of *lace*, which Mr. Talbot exhibited to the Society, and which was made five years ago, was preserved in this manner. But his usual method of fixing is different from this, and somewhat simpler—or, at least, requiring less nicety. It consists in immersing the picture in a strong solution of *common salt*, and then wiping off the superfluous moisture, and drying it. It is certainly singular that the same substance, which is so useful in *giving* sensibility to the paper, should also be capable, under other circumstances, of *destroying* it ; but such is, nevertheless, the fact. Now, if the picture which has thus been washed and dried, is placed in the sun, the white parts color themselves of a pale lilac tint, after which they become insensible. Numerous experiments have shown the author that the depth of this lilac tint varies according to the quantity of salt used, relatively to the quantity of silver : but by properly adjusting these, the image may, if desired, be retained of an absolute whiteness. He mentions, also, that those preserved by *iodine* are always of a very pale primrose yellow, which has the extraordinary and very remarkable property of turning to a full gaudy yellow, whenever it is exposed to the heat of a fire, and recovering its former color again, when it is cold.

When the paper was properly prepared, Mr. Talbot cut it to the size required, and kept it in a portfolio, or between the leaves of a book, so that it might not be exposed to the action of light : when he wishes to produce a drawing of a plant, lace, feathers, or any object that will lie upon the paper, he places the paper on a flat board, and then the object upon the paper, and over both places a piece of plate glass, to keep the object from moving : he then places the whole in the open air exposed to the direct rays of the sun, and obtains a beautiful representation of the subject in less than a minute : if the day is cloudy, it will take four or five minutes to produce the same object.

Sir John Herschel, Bart., has also directed his attention to photogenic drawing, and read a paper upon it to the Royal Society. The subject was disposed in its chemical relations. Sir John states, that confining his attention, in the first instance, to chloride of silver, he proceeded to enquire into the methods by which the blackened traces can be preserved, which may be effected by any liquid capable of dissolving and washing off the unchanged chloride, leaving the reduced or oxide of silver untouched. These conditions are best perfected by the hyposulphites : pure water will fix the photograph by washing out the nitrate of silver, but the tint of the picture remaining brick red, the black color may be restored by washing it over with a weak solution of hyposulphite of ammonia ; paper impregnated with chloride of silver was only slightly susceptible to the influence of light, but he discovered other salts of silver in which the acid, being more volatile, adheres to the base by a weak affinity, and which imparts much greater sensibility to the paper on which they are applied, such as the carbonate, the nitrate, and the acetate ; if the nitrate is used, it requires to be perfectly neutral, for the least excess of acid lowers its susceptibility in a remarkable degree. Sir John also notices a curious

phenomenon respecting the action of light on nitrated paper, viz.—its great increase of intensity under certain kinds of glass, strongly pressed against it, an effect which cannot be explained either by the reflection of light or the presence of moisture.

Dr. Golding Bird has written a very interesting paper on photography, as applicable to botanical drawing. He first examines the means used by M. Daguerre, in France, for preparing the paper, but prefers, for common purposes the paper prepared by the process recommended by Mr. Talbot. The great value of Dr. Bird's paper is its perspicuity: the statement contains the most practical directions for the preparation of the paper that has yet appeared.

"I have performed a set of experiments on this subject, and can recommend the following proportions as the most effective and economical:—two hundred grains of common salt are to be dissolved in a pint of water, and sheets of thin blue wove post paper saturated with the solution, which, for this purpose, should be poured into a dish, and, the paper being immersed, the application of the solution to every part should be ensured by the use of a sponge. The paper is then to be removed, drained of its superfluous moisture, and nearly dried by pressure between folds of linen or bibulous paper.

"Two hundred and forty grains of fused nitrate of silver are then to be dissolved in twelve fluid ounces of water, and this solution is to be applied by means of a sponge to one side of each sheet of the previously prepared paper, which side should be marked with a pencil, so that when the paper is fit for use the prepared side may be distinguished. The sheets of paper are then to be hung upon lines in a dark room to dry, and when nearly free from moisture, their *marked* sides are to be once more sponged over with the solution of silver, and finally dried; they are then to be cut into pieces of convenient size, and preserved from light, or even too much exposure to air, by being wrapped up in several folds of brown paper, and kept in a portfolio.

"The proportions above recommended are sufficient for the preparation of a quire of the kind of paper alluded to; if more of the salt of silver were used, the paper would indeed become darker by the action of light, but its expense would be proportionally increased; and when prepared in the manner directed, it assumes, by less than a minute's exposure to the rays of the sun, a rich mulberry brown tint, of sufficient intensity to define an outline very beautifully, which indeed is all that is required.

"To use this paper, the specimen of which a drawing is required, is removed from the herbarium, placed on a piece of the paper, and kept *in situ* by a pane of common glass pressed by weights: a piece of plate glass, however, is preferable, as it is sufficiently heavy to press the plant close to the paper. The whole is then placed in the sunshine, and in less than a minute all the uncovered parts of the paper will assume a rich brown tint. The paper should then be removed from the direct influence of the sun, and placed in a book until the drawing be rendered permanent; the specimen, quite uninjured by the process, may then be replaced in the herbarium, and the drawing of another be taken, and so on. So rapidly is this process executed, that twenty-five or thirty drawings may be obtained in an hour, providing we are favored with a direct sunbeam; if, however, we have only the diffused day-light, five or ten minutes, and sometimes even more, are required to produce a drawing with well-defined outlines.

"If drawings of recent plants be required, specimens of proper size should be cut, and if not too rigid, placed on a piece of the paper, and kept in a proper position by means of a pane of glass, as in the case of dried specimens; but if the plant be rigid, the specimens should be placed for twenty-four hours between folds of blotting-paper, under a heavy weight, before placing them on the sensitive paper.

"Having obtained as many drawings as are required, the next thing is to fix them, so that their otherwise evanescent character may not deprive them of their value. For this purpose place them in a dish, and pour cold water over them; allow them to soak for ten minutes, and then transfer them to, or sponge them over with, a solution, made by dissolving an ounce of common salt in a half pint of water, to which half a fluid ounce of the tincture of the sesqui-chloride of iron has been added.

The drawings thus prepared may be dried by pressure between folds of linen, and exposure to the air; and may then be examined without danger. On looking at them every one must be struck with the extreme accuracy with which every scale, nay, every projecting hair, is preserved on the paper; the character and habit of the plant is most beautifully delineated, and if the leaves be not too opaque, the venation is most exquisitely represented; (this is particularly the case with the more delicate ferns, as *Polypodium Dryopteris.*) Among those classes of plants, which appear to be more fitted than others for representation by this process, may be ranked the ferns, grasses, and umbelliferous plants; the photogenic drawings of the former, are indeed of exquisite beauty.

"The fact of the object being white on a brown ground does not affect the utility of this mode of making botanic drawings; indeed, I almost fancy that their character is better preserved by this contrast of tint, than by a colored outline on a white ground. Every one will be fully aware of the value of this process to the botanist, in obtaining drawings of rare plants preserved in the herbaria of others, and which he would otherwise have probably no means of obtaining.

"If the drawing of a tree or large shrub be required, a box, blackened inside, having a hole at one end about one inch and a quarter in diameter, must be provided; in this hole should be placed a lens of five or six inches focus; if one of longer focus be used, the dispersion of light becomes too great to ensure an accurate representation. When the tree or shrub is well illuminated by the solar beams, the lens should be presented towards it, at a distance varying of course with the height of the object. A piece of card-board should then be placed in the box, a little beyond the true focus of the lens, and the former moved until a well-defined bright image of the tree, &c., is formed on the card, of course in an inverted direction. The box is then to be placed on any convenient support in this position, and a piece of the prepared paper fixed on the card, the lid of the box is then to be closed, and the whole left for half an hour, at the end of which time a beautifully-accurate outline of the object will be found on the paper, which is then to be rendered permanent in the usual manner. It is obvious that this plan is unavailable on a windy day, on account of the branches of the tree, &c., being continually moving, so that it is of far less use to the botanist than the above described process for obtaining drawings of small specimens."

The foregoing extracts from the papers of Mr. Fox, and other scientific gentlemen, will enable the reader to form an accurate idea of photography.

I will now proceed to give a plain statement of my own experiments in this art, and endeavor to describe the process in plain language, that persons unacquainted with the meaning of chemical terms may understand the subject sufficiently well to procure drawings by the action of light.

First, procure half a quire of wove post paper; in selecting the sheets for use, hold them up to the light, and take only those that are even all over; the sheets of paper that have spots or streaks in them are unfit for the purpose: damp the sheets of paper by sponging them gently with clear water; lie them one upon the other, with a thick book or any kind of weight upon them, till they are regularly damped all over; then to a quart of clean water add two table-spoonfuls of salt, stir it round, and pour the salt water into a large dish; then take the damp paper, and draw the sheets gently through the salt water; let the paper drain a little, and hang it on a line to dry.

Nitrate of silver is a salt procured by dissolving silver in nitrous acid: when photography becomes in general use, persons that require a large quantity of the nitrate of silver, can easily form it for themselves from the pure metal; but for the purpose of experiment, it can be purchased at any respectable druggist, at about one shilling per drachm, and that quantity will be quite sufficient for the preparation of six or eight sheets of paper. There are many persons that deal in drugs in the country, who may not be acquainted with the article under the name of nitrate of silver, but that of lunar caustic, which is the same thing.

Pour clean water into a half pint vial till it is nearly full; in this, drop the drachm of nitrate of silver, it will soon dissolve and become a white powder; mix it well with the water by shaking the phial, and it is fit for use.

Before the silver is applied to the paper, it will be necessary to prepare a dark place to hang it to dry; where the paper is made in large quantities, a dark room will of course answer, but, for the purpose of experiment, I used a common size trunk, and placed three laths within it to hang the paper to dry, after I had spread the silver upon it. When the box is ready, shake the bottle containing the silver till it is thoroughly mixed with the water, and pour out about half a tea-cup full, and with a flat varnish brush spread it quickly and evenly upon the paper, taking care to leave no part untouched, and as quickly as possible hang the prepared paper in the box; proceed in the same way till you have as much paper as you require. It will not be advisable for persons that are making the experiment for the first time, to prepare more than two or three sheets of paper, as they will find that the sensibility of the paper may be increased according to the quantity of silver spread upon it; and it will be better to try the prepared paper before the whole of the silver is used.

When the first layer of silver is quite dry, wait till candle light, and then silver them again with the varnish brush, and again hang them in the box to dry. The reason why the second application is delayed till night, is to avoid bringing the paper into the light, as it would be sure to change its color in some degree, even at the first washing of the silver. If the hairs of the varnish brush are confined with tin, great care must be taken that the tin does not touch the silver, as it would entirely spoil it.

When the paper is quite dry, take it sheet by sheet from the box, and cut it to the size required, and place the pieces of paper between the leaves of a book, the moment they are cut. They are now quite ready for use, and will receive no injury from keeping for any reasonable time, so long as they are not exposed to the light; thus a person making a tour, and wishing to secure photogenic drawings on his journey, might take any quantity of the prepared paper for that purpose.

In order to get distinct drawings, it will be necessary to procure a piece of plate glass, about six inches wide and eight inches in length. This is all the apparatus required for drawing leaves, feathers, lace, or any subject that will lie flat upon the paper.

When the paper has got sufficiently dark, which will be easily seen, as it will quickly change and become of a deep violet color, nearly the same tint as the color of one of the plates. The subjects are now drawn; before the glass is removed, it should be taken to a dark part of the room quite away from the sun: the reader will be surprised at the beauty of the drawing; the subject, may, without any fixing, be deposited between the leaves of a book, without fear of change, if not again exposed to the light: thus as many as twenty or thirty drawings of most elaborate subjects may be taken in any hour at any time while the sun shines upon the glass.

I have tried what effect would be produced without the glass, by fixing the subject to the paper by weights, and have found that the drawing is not distinct, and there is a great difficulty ia keeping the subject still, which is quite obviated by placing the glass over it. If the party wishing to procure drawings should not have a piece of plate glass at hand, common window glass may be used; but in that case it will be necessary to place weights upon it to make it press the object close to the paper, otherwise the light will become diffused, and the lines will be indistinct.

The fixing I should always recommend to be done by candle-light, or at least where the room is sufficiently darkened to admit just sufficient light to see the objects. From the previous observations it will be seen that the silver, that has been acted upon by the sun or light, has changed its color, and chemically considered, it has changed its properties and name; but, of course, that which has not so been acted upon is still nitrate of silver, and as it has only been placed upon the paper by being mixed with water, soaking the paper in clean water for ten minutes will remove a great part of it. Mr. Fox and others mix salt with the water; but I have found that, after soaking for a time in cold water, that dipping it in about a pint of boiling water, in which two table spoonsfull of salt has been thrown, will increase the effect: after passing them through the hot salt water again dip them in cold water and let them drip; then place them between a clean cloth to absorb the moisture, and afterwards between the leaves of a book: when dry they may be shown without injury, if not

exposed to the sun ; if so exposed it will be sure to tinge them.

In preparing the paper in the first instance, instead of common salt, I have used a weak solution of alum, and afterwards spread the silver upon it ; the only difference was an alteration of the color of the ground, which, instead of violet or dark purple, was a dark buff or fawn color, and when the paper was dipped in the hot salt water, the drawing became a pale yellow.

The ground may be made of tints, but the three named may be produced without difficulty ; others require a more difficult process, and are of not the slightest consequence as regards the drawing, as that can at all times be washed over with any tint required, with water colors, without the slightest injury to the drawing.

Ladies will at once see the applicability of this art to procuring patterns. They require no further directions ; all that is necessary is to place the objects upon the prepared paper under the glass, and in three minutes while the sun shines, or about ten minutes if the day happens to be cloudy, the drawings will be produced.

Hitherto we have treated of flat subjects that can be placed under a glass, but photogenic drawings may be made from buildings, trees, or other subjects, by means of a camera obscura. It would be superfluous to describe the camera, as it has now become a toy that may be purchased in any town in England. If the lens is placed before any object that the sun is shining upon, that object will be clearly reflected by the lens upon paper placed within the dark box, and if photogenic paper, prepared as before directed, be placed in the box, it will give an accurate representation, which may be fixed, as before directed ; if the paper is only twice washed with the silver, it is probable that a profile only of the object may be obtained The architectural draughtsman will at once see the great utility of the art—it will enable him to sketch the detail and proportions of twenty parts of a building at the same time he is sketching the general outline ; and even the whole of the building may be taken if he can place the camera at a sufficient distance from the object.

As the art becomes more diffused, its applicability to many purposes at present unknown will become apparent. Photography is at present only in its infancy ; persons having leisure and discernment will doubtless greatly improve it ; but the foregoing directions will be found quite sufficient to enable any person to make successful experiments in this interesting discovery.

THE AMERICAN ART-UNION.

BY J. K. FISHER.

Since the article on Art Unions, published in your first number, was written, the American Art Union has held its annual meeting, at which its usual lottery was drawn, and a report of its transactions read. It appears that the number of subscribers, for the year, was 16,310, or 2,160 less than the year previous, a falling off of 16¼ per cent. In former years, there has been a large gain ; in '47 there was a gain of 54 per cent., in '48, a gain of 41½ per cent., in '49 a gain of 13 per cent., in '50 a loss of 16¼ per cent., as before stated. This rapid diminution of the rate of increase, and the sudden change to a great rate of decrease, show that the institution has been managed upon principles that are not favorable to its permanent popularity. Another fact, not less significant, was shown by the committee appointed some months ago, by the artists, to examine and report upon its transactions, namely, that about two-thirds of the members of '48 did not renew their subscriptions in '49 ; which shows that there must have been great dissatisfaction among those who had been persuaded to subscribe. And it appears that the great number of sub-

scribers were more than three-quarters new ones, who were drawn in by an enormous expenditure, for advertising and puffing, and by about seven hundred agents, called "honorary" secretaries, who receive a commission of two per cent, besides allowance for their expenses. The deception produced by the use of the epithet "honorary," enables these drummers to appear as disinterested and liberal friends of art; and has probably been an effective means of obtaining new subscriptions; but it is a deception which cannot last, and the detection of it, joined to the disgust occasioned by the miserable character of the prints, is the probable cause of the decline which has commenced, and which, we think, will become rapid and complete.

We commented, in our former article, upon their advertisement, that the engravings of the past year were worth twenty dollars—four times the amount of the subscription. The report states the cost of these engravings at less than a fifth of the subscriptions; hence it has been pretended that they are worth *more than twenty times* their cost. We apprehend that this ridiculous mode of persuading liberal people to contribute for the advancement of the fine arts, will soon use up the little that remains of reputation in the domineering oligarchy which controls this institution.

The falling off, which we have stated, was not plainly and frankly announced by the officers at the annual meeting; but it was veiled and glossed over so adroitly that most of the newspapers did not discover it, but reported, in general terms, that the institution was in a flourishing condition. This mystification may have had its effect in facilitating the re-election of the seven members of the committee whose term had expired; they were nominated for re-election, by their official brethren, and, without balloting, but merely by the aye or no process, re-elected—no one deeming it expedient to bore a large audience of ladies and gentlemen, who had come to witness the lottery, with speeches in relation to the conduct of the managers. But, judging from the fact disclosed by the investigating committee before mentioned, we presume that a large proportion of the audience resolved that they would not be duped again. Were it not for this obvious remedy for discontent—were members linked to the institution by a large initiation fee, so that withdrawal would be an abandonment of an interest worth contending for—we believe that, instead of a withdrawal of two-thirds of the members each year, there would be a change of at least one third of the committee, and of the whole committee, if there were legal means to get them out of office.

Not content with the enormous power they obtain by the picture-prize system, which places in their hands a patronage of more than eighty thousand a year, begged as a charity to art, or obtained by false pretences, as to the value of prints, and other matters; not content with the most oppressive use of this power, the committee publish a journal, called a bulletin, in which they have the insolence to assert that those whom they do not patronise are men of no merit. Nor is this all; for some weeks before their annual meeting, while their drummers were worrying men of business to subscribe, they kept many papers filled with their advertisements, of two and a half columns in length, for no use but to muffle criticism, and fill the room in columns that otherwise might have been open to the just complaints of artists whom they had calumniated, and whose works they had rejected, not for want of merit, for all admit that a portion of the works they purchase, have no merit at all; but because they cannot reduce these manly artists to servile obedience to their usurping and odious government.

We hear many eloquent harangues about the *liberty* of the press; and we doubt not its importance to the progress of all human affairs, and most especially affairs of literature and art: but what manner of liberty is it that they seek to establish in relation to the criticisms upon the works of artists? They bestow their advertising patronage upon their judges; and they print an expensive journal themselves, and send it far and wide, to their "*honorary*" secretaries, to country editors, and to all whom they wish to indoctrinate; and thus they endeavor to unite the whole press of the Union into a machine to crush their opponents, and to aggrandize themselves. Yet with all their craft and audacity they have got but few and meagre commendations from the press, and many indignant censures; yielding and mercenary as many

papers are to their advertising customers, they have been loth to sell their reputation for taste and justice, even for the prices bid—the rich advertisements of two and a half columns, and who knows what more ?

We believe that the New England Art Union, in Boston, is the one that is most likely to promote the fine arts, and to afford a fair opportunity for its prize-drawers to suit their tastes and wants; they will draw more prizes, which they may extend according to their own inclinations, with no restriction, but such as is deemed necessary to insure that they shall be spent for works of art. The names of Edward Everett and Henry W. Longfellow, who were among the applicants for the charter, are a sufficient guarantee that its affairs will be conducted upon principles of honor, and not in the low manner of quacks. We regret that we have not yet received a full account of the plan and progress of this institution; but the various partial accounts we have met with, are so uniformly favorable that we can cordially advise the friends of art to pay attention to any applications made in behalf of it. We understand that the drawer of a prize may select a work, or order one to be executed, in any part of the Union, provided that he gives satisfactory evidence that his prize is used wholly for the purpose intended.

MARTIN M. LAWRENCE AND THE DAGUERREAN ART.

BY THE REV. S. D. BURCHARD.

I am aware that I utter a truism and an exceedingly trite remark, when I say, that we live in an age of invention and progress. The human mind is pressed and stimulated to unwonted energy, and its achievements in science and the arts are amazing to contemplate. The forces of nature—the air, the water, the winds, the waves, the lightning, are all made subservient to the will and happiness of man. The multiplied uses to which these various elements may be applied are fully developed and brought to light. Discovery is one of the characteristic glories of the present age. We live, move and rejoice amid the trophies and the triumphs of mind. The productions of genius—the works of art actually startle us and make us feel that we are living in a world of wonders. Old things are indeed passing away, behold all things are becoming new. New modes of travel, of labor, of intercommunication, of competition and success are our inheritance, and the inheritance of our children. Of all the inventions which have distinguished the past fifty years, none is more wonderful, beautiful and useful, than the art of taking pictures by sunlight—of impressing the landscape, the trees, "the human face divine" on a plate of metal. Invisible they are at first, but none the less real, for by a very simple process are they made to stand out in all the distinctness of their originals.

The world, for six thousand years had rejoiced in the light of heaven, as it spread in loveliness over the earth, painting images of beauty on the clouds and the distant hills, but whoever dreamed that it would delineate, with infallible accuracy, the features of friends, and in lines so permanent that we might preserve them as memorials of their goodness, until the achievements of Daguerre and Niepce ? They have left their indelible *Daguerreotypes* on the page of the world's history. Their names will ever be associated with all that is fascinating and brilliant in the arts. Faint shadows of the art had indeed passed before the vision of man some two centuries before they lived, but they were mere passing shadows. These men by study, by genius, by patient and protracted toil, realized more than the shadows; or rather, they made the sha-

dows stay with them and converted them into substantial realities. *They* labored; but other men have since entered into their labors, and are carrying the art forward to its full perfection and beauty. This new discovery, while yet in its infancy was introduced to this land of genius and home of invention. Many of the votaries of the arts, the sculptor, the painter, the engraver, the etcher, looked doubtingly at first upon this new candidate for emolument and success. But Nature's artist, *the Light*, soon dispelled their doubts and prejudices, and multitudes, who had dogmatised and ignorantly doubted, now became disciples in this modern school of art. Many indeed fainted in their preparatory studies and forfeited the mead of success. Others graduated with honor, and their diplomas, written by the light, are now hanging on the walls of their studios—an ornament to their genius and the sure tokens of their success. Among the comparatively few who have really excelled is Martin M. Lawrence, whose portrait appears in the present number. Possessed of a mind feelingly alive to all that is beautiful in nature and fascinating in art, he early developed a genius and a taste for mechanical pursuits, and at the age of sixteen was apprenticed to a jeweller and soon became a workman, that needed not to be ashamed in the trade he had chosen. But it was too tame for his genius, he wanted something bolder and more beautiful, and when the Daguerreotype of a friend was put, for the first time, in his hand, and he saw its life like expression, he felt a new inspiration come over him and soon determined to change his profession—that inspiration never left him. It was both the stimulus and the pledge of his success.

He saw that many of his predecessors had utterly failed—that the art was still in its embryo—that the best operators were groping in comparative mist and darkness—that the results of their operations were always uncertain—their pictures often dim and shadowy, failing in the harmonious blending of light and shade, lacking in the boldness and beauty so essential to perfection in art. He set himself to work to learn the secret cause of failure. If some few had learned it before him, they were exceedingly chary and quite unwilling to communicate without a large reward. Some aspirants for fame freely paid the bounty; and one gave a hundred dollars for simply learning to use pure water in cleansing the plates, instead of acid and water. Others were filched of their money without being forwarded in their knowledge of the art. Mr. Lawrence pursued a more independent and philosophic course. He shut himself up in his laboratory and determined to experiment until he had gained the mastery. He furnished himself with the necessary apparatus, and became a thorough and practical chemist. He analyzed the processes of nature, learned how to combine her elements, so as to produce the most startling and beautiful effects. Nature became ductile in his hands, and her mysterious laws, guided by his skill, worked out the desired results. He had now learned and conquered the difficulties in the chemical department. Generous and free, his mind filled with the floating images of beauty, and anxious to see the art advance, he communicated freely with his brethren of the profession, and many an artist who has acquired an enviable reputation as practical operators are indebted, in no small degree, for their success to the timely suggestions of our friend, Martin M. Lawrence. He withheld no secrets from his pupils. He aimed not merely to make them amateurs, but *artists*. He endeavored to inspire them with his own high sense of the dignity and importance of the art. Excelsior was his motto, and those who left his studio, left with thoughts elevated above the mere grovelling idea of gain. They were to be co-laborers with the silent forces of nature, to hold communion with the light, to guide this subtle element in its sublime mission of love and beauty to man.

Whatever credit may be due to others—and others there are who have acquired a just and honorable fame—it must be admitted by all unprejudiced observers, that the subject of this brief sketch is not a whit behind the chiefest of his brethren in the photographic art—that his zeal, energy and perseverance are excelled by none, and that his success is placed beyond all reasonable peradventure or doubt. At one time, it was feared that he would become a martyr to his own devotion of the art. His confinement to his laboratory was so constant, his application to study so intense, and the vapors

arising from his chemicals so hurtful, that his health became seriously impaired, and his physician suggested that he would probably be obliged to abandon his favorite pursuit. He had now conquered the most subtle difficulties, and the broad field of honorable competition and success was open before him and the thought of yielding the laurel, and quitting an art so fascinating and all absorbing was too painful to endure. He now left the laboratory, committed the combinations of chemicals and the preparation of the plates to other hands. But still his work was not done; and though he had gained a reputation inferior to none in the rooms he had occupied in the years that were past, he felt that some improvements might be made in the arrangement of the light—this wizard *artist* in painting the Daguerreotypes of man.

He perceived, by varied experiments, that plates coated with the same chemical compound and apparently alike in quality, produced pictures of a very different character, both as to tone and boldness. His rooms were large and commodious, his patrons numerous and enthusiastic, but still he was persuaded that improvements could be made, in the way of light, by a removal. After diligent search, he, at length, found rooms which might be fitted up to his liking. They happened to be in the vicinity of some of his brethren of the art. But with a generous good will, he said, "Let there be no strife between us; we are devotees of the same art, and worship at the same shrine—the field is the world, and wide enough for us all." He nobly spurned anything like envy or jealousy and even rejoiced in the successes of his brethren. Again he devoted himself to his favorite pursuit with untiring assiduity. He studied especially the mysterious phenomena of light, learned some laws of refrangibility and color, which had hitherto perplexed the voteries of the photographic art. He constructed, in harmony with these laws, a sky-light 16 ft. by 16, and with such admirable arrangement, as to exclude all reflected, collateral or antagonistic rays (without the aid of inside screens) so that light from the heavens above should fall precisely at an angle of 45 degrees on the subject or sitter. Thus was the way prepared for Nature to do her own work, in all her breadth and beauty, producing pictures so perfect, characteristic and life-like as to charm every beholder. Such results however can only be produced by the greatest care in manipulation. By a failure here, many artists have been fretted and wearied with disappointment, attributing their want of success to bad chemicals or the state of the weather. More patience and skill have effectually overcome these difficulties and we are prepared to say, that any one, who visits Mr. Lawrence on a cloudy day will meet with a sunny reception and retire with a reflection of himself, so perfect, that he will be convinced that clouds and storms have little or no effect upon the operations of a good artist. His light, rooms, camera and apparatus in general are such, that groups of forty or fifty may be taken with ease, and yet each retaining that beautiful gradation of light and shade, that richness of tone and breadth of effect, which characterize the best *isolated* specimen of the art. He has in his rooms some portraits nearly the size of life. The one of Gen. James Watson Webb, prepared on a mammoth plate, for the World's Fair is truly magnificent. It would seem that such portraits might supercede the pencil and the brush. Color alone is wanting and yet there is an earnest and life like expression, a delicacy and decision of character, a glowing beauty in the soft and mellow blending of light and shade which have always given to the creations of the best artists their peculiar power to charm all the lovers of beauty and art. Mr. Lawrence's pictures have been regarded so perfect, that the application of the brush, for the purpose of adding more delicate tints, would seem rather to detract from than add to the essential merits of his portraits; and yet he has recently colored some with such exquisite delicacy and skill that they have been pronounced by the most eminent artists as equal to the finest miniature painting on ivory. The process of daguerreotyping on ivory has been referred to in a previous number of this journal as a higher development of the art. It may be so; we have examined some specimens, and confess that they are beautiful, wondrously true and life like; but we are persuaded that their beauty and expression are rather the product of the painter's skill, than the effect of any new

discovery in the Daguerrean art. Still the dim and shadowy outlines drawn by the infallible hand of Nature, do, to say the least, facilitate the work of the painter, and he may well afford to welcome *this* as a handmaid to his divine art. Mr. Lawrence has made arrangements with one of the best artists in this country, and those who prefer can be accommodated with pictures combining the skill of the Daguerrean and the painter. As to the comparative skill, genius, and taste requisite to success in the two professions, we would say, that neither can hope to rise above a tame and unenviable mediocrity who is not gifted by nature with a love, a *high enthusiasm* for the fine arts. No plodder, no mere mechanist, will excel as a Daguerreotypist. He must have an eye for color and a heart that responds to the poetic and beautiful, both in nature and art. He must feel the inspiration and possess the skill and acute discernment of the limner and the sculptor. In a word, he must be a *genius*, or be doomed to move in the wake of the lofty votaries of the art. It is enough to say, that Mr. Lawrence has succeeded, has *excelled*. It ought to be mentioned to his credit, that he was the first, we believe, to introduce the copying box, by which pictures may be copied as large or larger than their originals, a desideratum especially to those who wish duplicate Daguerreotypes of their deceased or absent friends.

No one, we are persuaded, can visit his palace-like rooms, without being fascinated with the brilliant specimens both of genius and taste, without being impressed with the beauty and utility of this most mysterious art; without an expression of gratitude for this sublime discovery, by means of which the shadows of our friends may be made to linger with us, and speak in silent and monotory tones, though the stout heart is still and the lip of affection is closed for ever. The patriotic, the good, and the brave, are there. The eloquent statesman, whose voice, like the clarion, has often hushed the clamors of the populace and gained the victory over his compeers of the Senate, is there. There is the great Apostle of Temperance from the Emerald Isle, in his white neckcloth and long black surtout, with his eye beaming benevolence. There, too, are the ablest divines of this favored land, and a whole army of missionaries, some venerable in years, covered with the scars of a hard and protracted warfare; others, glowing in the fervor of a youthful and unexhausted enthusiasm, looking down upon you with earnest eyes and seeming to speak with eloquent voices in behalf of the thronging millions of other lands, perishing for lack of vision and a voice divine to guide them in the way of life. If the galleries of other artists are adorned with the portraits of "*Illustrious Americans*," who have figured sublimely and successfully in the Senate and on the field; in addition to these, the Gallery of Mr. Lawrence is adorned with the real and life like portraitures of men, who are illustrious champions on the moral arena, and are battling hard and hero-like for the recovery of a world! No one can view them, with their companions by their side, with all the earnest love and piety of woman expressed in a face hallowed by prayer, without a fresh impulse to usefulness and virtue.

Mr. Lawrence has now reached his 43d year and the 9th of his artistic life. His course has been onward and upward, yet noiseless and unobtrusive. He has never sounded a trumpet before him, as have others, in the corners of the streets to attract the ears of men; but his success has been the result of his own quiet genius, blended with great application and energy of character.

When frequently asked, why he did not advertise? his uniform reply has been, "I prefer to write my own advertisements on well-prepared and polished plates." This has been his undeviating course—a course in beautiful harmony with his natural modesty and diffidence of character—a course, too, which has secured for him a reputation more durable than the plates of metal which reflect alike the genius of the artist, and the exact portraiture of his myriad patrons and friends.

PHOTOGRAPHIC RE-UNIONS.

BY THE EDITOR.

"As well might you try to bring the sun and moon together—or cause fire and water to agree, as hope to establish a feeling of harmony and good fellowship among Daguerrean artists; or to obtain the secret of a single discovery made by any one of them."

Such was the remark made to us, on a certain occasion by a Daguerreotypist, and we propose to make it the text for preaching to him, and others of similar views, quite a long sermon, which we trust will have some weight and produce a different feeling.

We have lately been reading one of Arthur's graphic and truthful domestic tales, entitled, "The Way to Prosper; or in Union there is Strength;" which we would advise all men of such way of thinking to read. The story itself has no particular bearing upon the remarks of our friend, but it inculcates a lesson not foreign to the sentiments we wish to express.

It is a soul-stirring tale, entirely domestic in its nature, and showing the advantages of perfect union between the members of a family, both around the home fire-side and in business.

Now, we conceive that this same kind of union among men in the same line of business, must be equally beneficial to them, and we shall endeavor to point out the reasons why it should be so, in order that we may bring the Daguerrean artists together into one great body, striving, not only for their own individual good, but for that of the whole, as if they were but one man.

When the artisan or mechanic finds his employer disposed to be overbearing, and wishes to prostrate him to the earth by depriving him of his just rights, he collects his fellow workmen around him, forms them into a protective force, and obtains what he could not by his single exertions. *He* finds that "in union there is strength."

The printers—a class of men than whom there never existed a nobler, nor yet a more victimized—have found that "in union there is strength." Were it not for the Typographical Societies in existence all over the country, they would be, as formerly, the most buffetted among the buffetted. Their profession, like the Photographic, not being wholly mechanical, but requiring a degree of education, to be acquired only by long and close application, demanded that protection which could only be given to it by a consolidation of the whole mass into one great society, or brotherhood. Their education creates in them an ambition to appear, and be men—men on whom the world would look with respect, and whose influence must be felt.

To effect this, they found it necessary, both as a matter of reputation and interest, to create these societies. They found that a class of men, whom they technically call "Rats," whose moral qualities were considerably below the true standard, and whose education and skill were equally low, were disposed, not only to depreciate the value of their labor, but also their moral and social influence. To counteract the baneful effects which are always sure to follow intimate association with men of narrow and vicious minds, the more talented and respectable portion of the profession, resolved upon the formation of Typographical Societies, into which were to be admitted those only who were worthy associates.

At first, considerable opposition manifested itself, particularly among employers, and those whose consciences told them they were unworthy; but the persevering efforts of the originators of the scheme finally won the approbation of the employers, and the result is a union of strength, between employer and employee, which renders them equally careful of the prosperity of each other—protects them from interlopers of inferior grade, and keeps up a lively ambition in all to merit the esteem of their brethren, and of the public at large.

Now, we conceive that the professional community of Daguerreotypists of the present day, stand in relation to each other precisely as did the Typographers a few years back.

While they have among them, men of

acknowledged talent, taste and ability, there are many who, by their arts, sentiments and feelings, tend greatly to depreciate the art in the estimation of the public, particularly with persons of refined tastes and cultivated minds.

To use their own words, "there is a great deal of humbug in this world," and by its practice alone can they hope to obtain a share of business. These are the men who "know enough already," and do not believe it possible for artists to receive benefit from works or periodicals on art; our opinion of these men we gave in our first number, and we only call attention to them here, in order to convince our friend whose remarks head this article that his profession contains those kind of men, denominated by printers, and appropriately too, *Rats*. In order to make the term more comprehensible to the unitiated we will give some of the traits of the long-tailed animal, and draw the comparison.

The four legged rat skulks and sneaks about the habitation of man, and by his gnawing and excavating propensities, gradually undermines the structure, which will eventually tumble into ruins if means be not taken to prevent it. He has not the slightest regard for his fellows, and would not hesitate to kill any one that stood in his way—this is a trait peculiar to most brutes; they are very slippery fellows, and mostly given to low haunts, and never rise very high above the ground level, unless attracted by some thing that may appease their gluttony. They are the common aversion of man and beast.

These traits of character, the respectable printers conceived to be the most prominent in these they term *Rats*. They are, almost without exception, men who, having served one third or one half the requisite time necessary to acquire perfect mastery of their profession, have ran away from their employers, and endeavored to obtain situations by offering to work for a much less sum than could possibly support them. They generally commence their career in bad company, as apprentices, and end in worse, as pot-house loafers.

Until the formation of Typographical Societies, the more respectable printers were often brought in contact, through the cupidity of employers, with these men, and obliged to associate with them, or be rendered very uncomfortable in their situations. Now, to be branded as a *Rat*, is certain death to their social intercourse in their profession, and they are obliged either to seek other employment, or mend their manners.

There are "*Rats*" in every business; two of the legal profession have lately been sent to Sing-Sing—but there is not an art, trade, or profession offering them stronger inducements, or more easy access than the Daguerrean, and it cannot be a matter of surprise to any one if advantage is taken of the offer, and the situation abused.

If the evil of their admittance to the profession was confined entirely to those who create it, it would be of comparatively little consequence; but it is not. Others suffer by the contact. When any particular branch of businass is made up by a majority of low-minded men, whose daily acts entitle them to the scorn and animadversions of the community at large, that business must unavoidably become degraded in the eyes of all upright men, and it must either be purged of its vile members, or be entirely abandoned to them.

Very near this position stands the Photographic art in the United States at the present day; and it will not be long ere our friend will find himself obliged to work heart and hand with his Daguerrean brethren of equal standing, to maintain the respectability of his profession.

In assuming the editorial charge of this journal, we did so with the determination of doing our duty to the Photographic art itself, and not for the purpose of pampering the views of every individual member of the profession. It is a duty in which we expect to receive as many buffets as commendations; but we shall not shrink from it. We feel confident that a time will come when our strictures will be looked upon by our very opponents of the present day with favor. They, at least some of them, must even now acknowledge that we have good cause for what we have written; and that the time has even now come when the profession needs purging, and its character elevated.

There is but one way of doing this, and that is by the formation of a national Photographic Society, wherein something more than a mere monied qualification shall be necessary for admission. A certain grade of excellence in photographic pictures,

a high respectable standing socially, and an honorable gentlemanly deportment in business transactions, only should entitle a man to admission.

Bound together in such a society, the profession must rise in the estimation of the public. The deliberations of their meetings will be looked for, and commented upon with as much interest as those of the American Art-Union of our own country—or the Royal Society of England. Bad associates will be driven off, and the unwary will not be so often deceived by quack *improvements*.

In addition to the strength, stability and increased respectability of the profession, each member who makes a discovery worthy of adoption, will find it to his interest to submit it to the society, and receive its approval, in the greater confidence it will give the public in his ability. This, in its turn, will beget an ambition in all to strive for improvement—a new impulse will be given to the art, and not only the operator will be stimulated to greater exertion, but the public will become more excited and interested, and a greater prosperity to all concerned will be the result.

There is no dreamy philosophy in this view. Other professions have tried it successfully If the portrait painter, landscape painter and engraver are benefitted by Art Societies, we see no reason why Daguerreotypists should not be. On the contrary, there are many more reasons why they should than should not.

The arts of painting and engraving have attained that perfection beyond which it appears impossible to go—they have improved—with the exception of wood-engraving—very little within the last century; whereas, photography is but in its infancy, and subject to improvement almost every day. From the very origination of society, these improvements can be of little use to the discoverer, unless he succeeds in impressing upon the public mind their actual value. This he cannot do permanently if he keeps the secret entirely to himself, for the public, being naturally suspicious, are soon induced to join in the cry of "*humbug!*" set afloat by a cunning opponent, and the discoverer is more frequently injured than benefited by his improvement.

In the whole range of our Daguerrean acquaintance, we do not know one who has increased his business one dollar by advertising a secret improvement, and we venture to assert none have.

The English and French understand these things better. No sooner is a discovery made and perfected than it is given to the public; often, it is true—but only when the process or manufacture, by its sale, largely remunerates the inventor—restricted by a patent.

The operator will probably ask, what security have I, if I make my discovery public, even if patented, that other artists will not use it, and deprive me of its benefits? To this we answer, that in the present state of the profession you have none, but if others adopt it, it will be the more lucrative to you, inasmuch as the public will put more confidence in your ability as an artist, and reason, that as you were the original inventor, you were the most capable of using it, and the majority would give you the preference.

This query, however, gives us another point of argument in favor of a Photographic Society; for, as a body of honorable men, the members would disdain appropriating a fellow member's invention without just remuneration. A clause might also be inserted in the by-laws, making it a serious offence, punishable by expulsion, so that in every way the artist would be better protected in his rights than he now is by the most profound secrecy; for, as we have said in our first number, some other might make the same discovery, and deprive him of both the honor of discovery and the right to its exclusive use.

We think we have now shown pretty conclusively that it is to the interest of every respectable Daguerreotypist to throw aside any petty jealousy he may feel towards his brother artist, and unite him in closer bonds of amity, and we trust that before the completion of the present year, we shall see the Daguerreotypists of the United States meet, by their representatives, in convention for the organization of a National Photographic Society.

We learn that one has been formed at Utica, in this State, with D. D. T. Davie, Esq., as president; but he must excuse us for expressing the opinion that, although we consider it a good beginning, and the members deserving of all praise

for the initiatory step—it is too local and confined, and got up with too much secrecy to be available as a national thing. It can never be any thing more than an auxilliary society.

To give general satisfaction to the profession, who are scattered over all parts of the United States, from Maine to Texas, all sections of the country must be represented in convention, the better to understand the views of all, dissipate any prejudice that may exist, and knit more closely and firmly the bond of union. Let Daguerreotypists do this, and they may take our word for it, they will find, before many months, that "In Union there is Strength."

BROMINE AND ITS COMPOUNDS.

Bromine is a simple substance, and was discovered by M. Balard, of Montpelier, in 1826.

It is prepared by passing a current of chlorine through the liquid which remains after the evaporation of sea water to obtain common salt. This liquid is technically called bittern, and usually contains sulphates and muriates of soda and magnesia, with a small quantity of hydrobromic acid in combination with magnesia or the hydrobromate of magnesia.

When the chlorine is passed through the bittern, it assumes an orange tint, in consequence of bromine being set free from its combinations, the chlorine uniting with the hydrogen of the hydrobromic acid and forming muriatic acid. The free bromine is then agitated with sulphuric ether, and the mixture is allowed to stand until the ethereal portion, holding the bromine in solution floats upon the surface. This is then carefully poured into another vessel, so as not to disturb the residuum, and agitated with a solution of potassa, by which means bromide of potassium and bromate of potash are formed.

The whole is then evaporated to dryness, and submitted to a dull red heat; the residuum is then powdered, mixed with pure peroxide of manganese, and placed in a retort; sulphuric acid, diluted with half its weight of water, is now poured in. Red vapors immediately arise, and condense into drops of bromine, and are collected by plunging the neck of the retort to the bottom of a small receiver, containing cold water. The bromine forms a stratum beneath the water, and may be collected and further purified by distillation from dry chloride of calcium.

Bromine is liquid at natural temperature of a dark reddish color, and a disagreeable odor resembling chlorine. It freezes at 4°, boils at 116° 5′, is about three times as heavy as water, is very soluble in ether, less so in alcohol, and only slightly so in water. The following combinations are formed with bromine.

Hydrobromic Acid :—Consists of one part of bromine and one of hydrogen, and may be made by mixing the vapor of bromine with hydriodic acid, sulphuretted hydrogen, or phosphuretted hydrogen gases; decomposition ensues, and hydrobromic acid is generated. With nitric acid it has the property of dissolving gold.

Bromic acid :—is composed of one equivalent of bromine and five of nitrogen, and is prepared by the action of any pure alkali or ether on separate portions of the bromine when bromic and hydrobromic acids are generated.

Bromine is variously used in the Photographic art. The

Bromide of Potassium—which is made by agitating bromine with a concentrated solution of caustic potassa, and collecting the crystalline precipitate, and purifying it by solution in boiling water and crystalization; is used as the first wash in many instances, on photographic paper.

The following are some of the forms in which it is used in Daguerreotyping.

Bromide of Iodine:—There are two methods of preparing this compound. In mixing it much depends upon the strength of the ingredients; an equal portion of each being generally used. To avoid the difficulty arising from different degrees of density of the two chemicals, it would be as well to make a solution in alcohol of half an ounce of chloride of iodine, and add the bromine drop by drop, until the mixture becomes of a dark red color; then dilute with distilled water, until it assumes a bright yellow. Put about an ounce of this compound into the bromine jar, and coat over it to a violet color. Change the solution when it becomes too weak to produce the desired effect.

The other method, is to mix half an ounce of bromine with one ounce of chloride of iodine; add two quarts of pure distilled water; shake it well, and let it stand for twelve hours; then add twenty five drops of muriatic acid and let it stand another twelve hours, occasionally shaking it up well. Dilute one part of this solution in ten of water. Coat over dry iodine to a deep yellow; then over the sensitive to a deep rose color, approaching purple, then back, over dry iodine from four to eight seconds.

Hungarian Liquid:—This is a sensitive that has never been used in this country, but in Europe is considered very excellent, as it acts quickly and with considerable certainty. The receipt which we now give for making it has never been published before in this country and it was with some difficulty that we obtained it. Take a given quantity of bromine—say two ounces—put into it as much dry iodine as it will take up, and when completely dissolved add more bromine until the mixture assumes a perceptible red color; again put in sufficient iodine to make a saturated solution, and add to the mass about one ounce muriatic acid. Dilute with a strong solution of lime water—about eight parts of the latter to one of the mixture. In using it, it may again be diluted with from ten to fifteen times its bulk of water. The plate being previously iodized to a light yellow, is submitted to this mixture till it assumes a light rose tint.

Fluoride of Bromine:—This is a combination of bromine and fluoric acid, of about one part of the former to four of the latter. We would not, however, advise artists to use it, as it is not only a dangerous poison, but is exceedingly destructive to the lenses of the camera. The fluoric acid attacks the glass and in a short time corrodes it so as to render it entirely useless.

Bromide of Iodine and Lime.—This is somewhat similar to the *Hungarian Liquid*, but prepared in a different way. It was first made by Mr. E. C. Thompson. Make a strong solution of lime in a quart of water—add to it half an ounce of chloride of iodine, and then drop in sufficient bromine to take up the chloride of iodine; the best way is to put in one-eighth of an ounce of bromine and add a few drops daily until the chloride of iodine is taken up—care being taken not to get too much; then put in sixty grains nitrate of silver; shake it well, and add thirty drops nitro-muriatic acid. Put in the jar about a table spoonful of pulverised alum, and add one part quick with six of water. Coat over dry iodine to a light lemon color, then over the quick to a deep orange, and back over the odine one quarter of the time required by the quick.

Bromide of Lime.—This is one of the best sensitives used. It is easily made; works with more certainty and evenly and produces a fine toned picture, although to our mind—not equal to those from bromide of iodine. It is prepared in various ways; the following being about as good as any. Take a lump of lime and soak it in alcohol about two hours; then expose it to hot air until it is as fine as flour. To one pint of lime put half an ounce of bromine and three table spoon's full of powdered alum. Put one-third of this into a half plate box, and as it becomes weak add more, aud so on till you have the whole pint. After this, a few drops of bromine occasionally will make it last six months. Coat over the iodine to a yellow, then over the quick to a violet, or plum color. A little dry chlorine—say a table spoonful—to the pint of the mixture will improve it.

To detect the presence of bromine, the solution of the chloride of gold gives a red tinge with hydrobromic acid, or an electro-positive hydrobromate.

When bromine exists in an organic mixture, caustic potassa should be added to the mass, which should then be re-

duced to an ash, exhausted by distilled water, and chlorine passed through the solution, or the chloride of gold added to it, previously carefully neutralized by hydrochloric acid.

Bromine is very corrosive to the flesh and operators are frequently burned by not being sufficiently careful in its use. To counteract its effects the artist should always have at hand a bottle of ammonia, which he should sprinkle about the room when making his sensitive; it entirely neutralizes the disagreeable fumes of bromine.

He should also be provided with a solution of magnesia; or hyposulphite of soda into which to plunge his hands in case of bromine being spilled upon them.

Solutions of starch, and white of eggs are also antidotes to the poison, and may be used to wash its effects from the eyes or mouth.

PRACTICAL PHOTOGRAPHY.

Galvanizing Plates.—This process is much less used than it should be among our artists, if we take into consideration its economy.

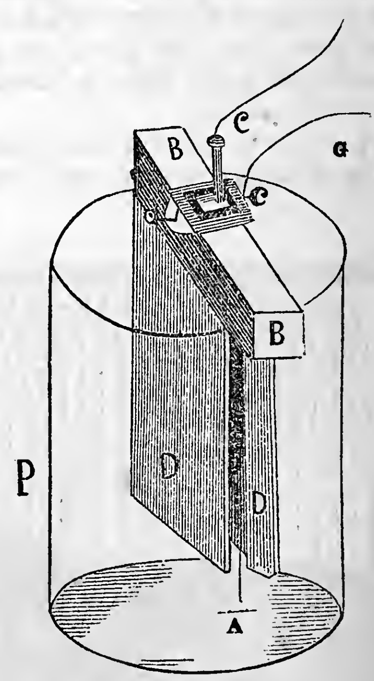
The idea has obtained that plates should be so perfect that a resort to it should be rendered unnecessary. We have endeavored to show, in our articles on the "Difficulties of the Art," that in a majority of cases the faults attributed to the plate, actually arise from some external cause; either the carelessness of the operator, impure water, bad chemicals, or particles of dust which attach themselves to the plate, either in the camera, or during some other part of the process.

Our investigations have led us to the conclusion that the only real cause of complaint are the scratches which the surface of the plate receives by carlessness, and what we shall term, the sand holes; which we conceive to be owing to particles of sand getting between the silver and copper during the manufacture of the plate.

These may be remedied, at trifling expense by galvalism. To an operator who does a good business, the trouble and expense can be of no consideration when compared with the loss of plates from the above mentioned causes.

Another consideration should induce its more general adoption. The plates are rendered more sensitive to the action of light; the time of exposure in the camera, with the ordinary sensitive being considerably reduced.

There are several kinds of batteries used for the purpose, one of the best being Smees', a figure of which, and description we append.



It consists of a piece of platnized silver, A. on the top of which is fixed a beam of wood, B. to prevent contact with the silver. A binding screw, C., is soldered on to the silver plate to connect it with any

desired object, by means of the copper wire, *e*. A plate of amalgamated zinc, D. varying with the fancy of the operator, from one half of the entire width of the silver, is placed on each side of the wood.

This is set into a glass or porcelain jar, P,—the extreme ends of the wooden bar resting upon its edge—on which the acid with which it is charged has no effect.

The jar is charged with sulphuric acid, (common oil of vitirol) diluted in eight parts its bulk of water. The zinc plates of the battery have been amalgamated with quicksilver, and when the battery is set into the jar of acid there should be no action perceived upon them when the poles F. G. are not in contact.

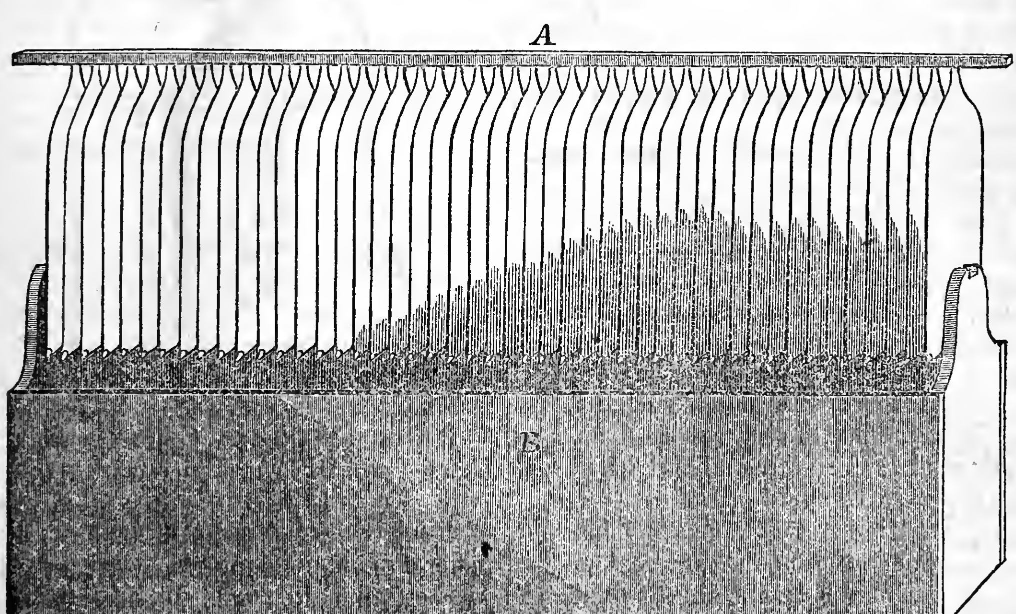
Should any action be perceived, it indicates imperfect amalgamation ; this can be easily remedied by pouring a little mercury upon them immediately after removing them from the acid, taking care not to get any upon the centre plate A.

Directions for Use.—A sheet of silver, say about three and three quarters by four and a quarter inches in size, must be attached to the end of the wire *e*. F. connected with the centre plate A. of the battery, and placed in the silver solution—prepared as directed below—which is held by a solution porcelain jar of an oblong form and sufficiently large to admit the largest plate you use.

The plate to be silvered is first cleaned with diluted sulphuric acid, and then attached to the wire *c*. G., proceeding from the zinc plates D. D. and then placed in the silvering solution—opposite to the silver plate attached to the pole *e*. F., and about half an inch from it. A slight effervescence will now be perceived from the battery, and the silver will be deposited upon the Daguerreotype plate, while at the same time a portion of the silver plate is dissolved.

To Prepare the Solution of Silver.—Dissolve one ounce of chloride, or oxide of silver in a solution of two ounces of cyanide of potassium, previously dissolved in one quart of water. The oxide of silver is in most general use. The time allowed the plate varies with the strength of the solution, from five to twenty minutes.

A more simple form of battery is figured below. It is equally good with Smee's and possesses the advantages of being very cheap and easily constructed ; it may be made of any size desired ; sufficiently large to admit either half a dozen, or half a gross of plates at a time. Plates, in fact, may be made with this battery at a reasonable expense, but not, as has been asserted, for *fifty cents* a dozen. Copper may be coated to about that amount, but we question if they can be made available for much less than two dollars and twenty-five cents, whereas one dollars worth of solution will coat a gross or a gross and a half of ordinary daguerreotype plates, and make them much more effective.



This battery is constructed as follows. Have a box made four and a quarter inches wide, four and a half deep, and six inches long, or according to the largest sized plate you use—with the ends projecting considerably—say three inches—above the body, as at *a* in the engraving. Line it with sheet gutta percha—upon which acid has no effect and it is ready for your solution.

To a square rod, to project about one inch from either end of the box, are fixed a series of zinc plates as at *b*, half an inch apart. These plates are so constructed—as may be seen by reference to the engraving—as to hold a daguerreotype plate on each side. When filled with the latter they are plunged into the solution contained in the box, the rod resting in groves cut in the top of the projecting ends; galvanic action immediately takes place, and the plates may be suffered to remain immersed during the artist's pleasure. The longer they remain the heavier will be the coating.

The plates should be well polished in the usual way before immersion.

Directions for Making the Silvering Solution.—We shall give these directions in the most simple language, that every one may be enabled to make the solution.

Dissolve, in a porcelain cup over a slow spirit lamp flame, one ounce of pure silver in nitric acid; add about a gill of water; then precipitate the silver with eight tablespoonsful of common salt. Drain off the liquor, and wash the precipitate in three waters; each time pouring the water all off. Then add two ounces dry cyanide potassium—mix well together until the precipitate is all dissolved, and then add four quarts of water and filter.

Smaller quantities may be made, being careful to use the same proportions. Care should be taken in either of the above silvering processes to keep the solutions clean. It would be well, therefore, to keep the solution troughs always covered with a piece of buckskin or thick cloth.

To Mix Gilding Solution.—Take two-thirds of a pint of pure soft water, put into it sixty grains of hyposulphite of soda, and thirty grains of fine salt, put the whole into a bottle and shake them up well, until dissolved; then dissolve in another bottle, containing one-third of a pint of water, eighteen grains chloride of gold. Pour the last solution into the first and filter.

THE AMERICAN ART-UNION AND NATIONAL ACADEMY.

BY GABRIEL HARRISON.

[We give place to the following communication of our friend, from the fact, that it is a corroboration of the many complaints which have appeared from time to time in the papers of this city. We have no personal hostility towards the Art-Union; but "where there is so much smoke there must be some fire," and we shall always lend our aid in correcting abuses wherever they may exist in the world of art.—*Ed.*]

The American Art-Union, which has not only a great reputation for the great number of subscribers it has hitherto obtained to its yearly distributions, but for the many poor pictures it has distributed, is about accomplishing that for which its misguiding rulers have so long most devoutly wished, the destruction of the individuality of the National Academy of Design; the absorption of the Institution that virtually gave it being.

It is a well known fact that when the charter for the Art-Union was before the New York Legislature, it was in danger of being defeated in consequence of the general opinion among the members of both Houses that it would interfere with the Academy of Design, and it was only saved

by the acquiescence of the Academy to its passage. A most mournful and suicidal act, for

> "Shattered now and dying,
> See how they deride
> All its glories flying
> On the gusty tide."

We do hope, however, that, before it be too late, Academicians will "have a quick eye to see" and take no nourishment from the would-be paracide, from an institution that publicly declared that it would make no purchases of art from any member of the academy, or even from any painter who should exhibit his works in the halls of that Institution, and that has ever evinced towards it a bitter and uncalled for opposition. This too, towards the only institution in the whole United States that has ever done any real good for American art; for it has given us a life and an antique school, and certainly, once a year, a meritorious exhibition of works from American artists which have been profitably visited by thousands of our best citizens both young and old; and none will deny that as a resort for fostering and improving the taste for art, or as a place for rational amusement, it has had no superior. You entered its halls and the exquisite display of pictures by our artists imposed a silent admiration upon you. Without annoyances of any kind, you could examine and criticise each picture at your leisure, and if so desired make your selections for purchase from those on sale.

How unlike is the American Art-Union exhibition room. There few pictures of decided merit are ever seen to inspire the beholder with proper feelings, or even offer a theme for instructive conversation—there the rude, the vulgar, and the blasphemous meet, and make it disgusting to persons of refinement, and who have the tastes and desires to admire and cherish the productions of our native artists.*

These are no idle assertions; they are stern, indisputable facts, which may be daily and hourly realized by any person of observation who may saunter a few moments through that hall of cheap productions. What can we expect, however, from an institution that has for its key-stone one of the most immoral principles that besets the heart, and tempts the cupidity of man,—the spirit of *Gambling*. I say, better let art die—moulder to ruin in its infancy,—become the sear and yellow leaf prematurely—than make it a stepping-stone to infamy. Better that it should be trampled under foot than that the flowers with which it adorns the pathway of man's pilgrimage through life, and elevate his tastes to the highest and brightest points of civilized life, should be made the handmaid to the baser passions. To couple them is like entwining a serpent in a boquet of flowers, or mingling the voice of the nightingale with that of the owl.

If Britain desires to mantle her gems of art in these sable garments of disgrace, by introducing this degrading system of cherishing her painters, so be it; but let her bear the odium alone. Why should we be so ready to ape her evil practices—we, who as a nation, have gained the fame that has crowned us with our present glory by *moral prestige*, not by the *gamester's code*.

The time has been when art was appreciated and cherished without the aid of the *dice box* or the *lottery* wheel. Rome did not rattle the dice and throw for the works of her *Angelo*, nor did Spain spin the lottery wheel for those of her *Murillo*, Germany for those of her *Lassing*, England for those of *Wilkey*, nor America for those of *West* or *Allison*. These of our countrymen, without the aid of Art-Unions received the encouragement that enabled them to attain that position in the world of art which they so justly held. I would ask any one of our artists if they can truly say that the American Art-Union has ever been of service to them or multiplied the demand for their works? Can any aspiring young American artist say that the American Art Union has lent him the hand of encouragement to advance him one jot in his arduous profession? It is proverbial among artists that they receive less orders now than they did before Art-Unions existed.

The treatment of the American Art-Union towards some of our young native artists has been most culpable. Pictures, sent to it by its own invitation for exhibition, have been retained for five or six weeks, and then returned in the most insulting manner with the frames shamefully broken. I can and shall relate some startling facts

* This is very strong language; but we have heard similar remarks made by ladies.—*Ed.*

of the most scandalous treatment some of our own *distinguished* artists have received from the Art-Union, while many poor productions nave been purchased from foreigners who have been but a few weeks in the country. We do not object to those who have made our country their home, and whose pencils deserve encouragement, but I do object to the wholesale preference given to those who are no more worthy then our own artists, and whose claims upon the American public are inferior.

With these facts before the members of the Academy of Design, can they honorably, or even respectably receive assistance from the Art-Union? Can they debase their noble institution by accepting funds for the liquidation of their debts from an institution that has been the main cause of its embarrassment. I sincerely hope not.

May I be so bold as to ask where is A. B. Durand and Charles C. Ingham; where is Elliot, the Mounts, Evers, Proudhomme, and a host of other brilliants in the *world of art*, that they stand aloof in this extremity of their former cherished Academy—(the only institution they ever had that is glorious and good in art)—and see it stoop so low as to ask charity of its antagonist, and for such a paltry sum too, when they can, by each painting a picture gratuitously for the Academy, relieve it without the aid of the Art-Union. Why should they wait three months for the deliberation of the managers of the Art-Union and then take their *scrip payable in six months*, when the same sum may be realized in the same manner in much less time?

Why accept the interested offer of the Art-Union—interested because it is made at a time when it becomes necessary for its President to do something to save the popularity of his institution—when the affairs of the Academy may be settled by your own united exertions. The Art-Union never would have made the offer had not the people had a peep into the *dice box concern* and became convinced of its wretched condition and bad management. Never would they have offered a helping hand were it not that their charter is about to expire and they needed the influence of the Academy to obtain a renewal. Never would the offer have been made except through the fear of the total destruction of their institution.

Academicians, spurn the insulting offer. Stand proudly erect on your own broad foundation—let not the institution that wreathed the laurel that adorns the brows of a Truman, and a Cole, seek assistance from the gambling table. Meet in your council chamber; call your fellow-citizens around you; tell them you are in debt, and that thirty-six or more have agreed to paint a picture to liquidate the debt, and call upon them to purchase these pictures. If there must be a distribution let it be one of your own—made, too, in an honest and lawful manner, and you will realize six times the amount in cash—not in six month's scrip. For heaven's sake, gentlemen, take not from the American Art-Union—"such protection as vultures give to lambs; covering and devouring."

For the Photographic Art-Journal.

THE NATURAL COLORS.

H. H. Snelling, Esqr.—A few months ago, I briefly announced, on the cover of my last publication on Photography, the fact of my having solved the great problem of *Chromatyping*. This is all I have ever published in relation to the matter; but as you have kindly noticed my discovery in your valuable Journal, and as I am assured by my friends, and by the large number of letters I am constantly receiving, that an interest is beginning to be felt in the discovery by the Daguerrean fraternity, I will give a statement of the facts in the case.

Some two years ago I commenced experimenting with a view to this great desideratum, but with little faith. I started with the theory that circumstances might be created, and certain juxtapositions arranged whereby a *latent colored image* might be imprinted by means of the camera, on a prepared sensitive surface, and that mercury not being the only vapor possessing a *developing power*, some other vapor or substance might be found, which, while it would develope, would preserve the colors of the said latent image. I found a large number of substances which would develope the images in *light and shade.* After almost numberless experiments, in which I produced nothing but *light and shade*, (save in one instance in which the red of a colored dress was brought out,) I was about giving up the pursuit, when I quite unexpectedly formed a *singular compound*, which I applied to the purpose, and succeeded in obtaining *a magnificent picture in colors.* This picture is quite equal to any I have taken since.

The *compound* above referred to, is, to me, a nondescript, though I have made the science of chemistry my study for years. That it is a new substance, or combination of substances, I am positive, and this is all I know concerning it. It is simply and easily produced, but not by any law stated in the large number of chemical works with which I am familiar. Doubtless, however, a correct and thorough analysis will determine its nature.

My process bears no resemblance to Becquerel's or Sir John Herschel's, and it is *essentially different* from Daguerre's. I am indebted to much *humbler sources* for my success, as the sequel will show. All is perfectly simple, and a good Daguerreotypist would master the process in one day. That the discovery will completely supersede Daguerreotyping, I have the assurance of many eminent artists. No Daguerreotype ever taken will at all compare with these marvellous pencillings of the colored rays.

Among my forty-five specimens, I have the following:—

1. A VIEW, containing a *red house*, *green grass and foliage*, the *wood-color of the trees*, several cows of different shades of *red* and *brindle*, *colored garments* on a clothes-line, *blue sky*, and the *faint blue of the atmosphere*, intervening between the camera and the distant mountains, very delicately spread over the picture, as if by the hand of a fairy artist.

2. A *sun-set scene*, in which *the play of colors upon the clouds* are impressed with a truthfulness and gorgeous beauty which I cannot describe.

3. SEVERAL PORTRAITS, in which I have the *true complexion of the skin*, the *rosy cheeks and lips*, *blue and hazel eyes*, *auburn, brown, and sandy hair*, and *every color of the drapery*. *Changeable silk* is given in all its fine blendings of colors, and delicate richness of hues. I not only get red, blue, orange, violet, &c., but their *various tints.* The whole impression, including the lights and shades, is far more *brilliant*, *round* and *mellow* than the most superb Daguerrean image I have ever seen. This, I am aware, is saying much, for I have had a familiar acquaintance with many fine specimens of Daguerreotype, in the hands of such men as Root, Brady, Haas, Lewis, Meade Brothers, A. Morand, Gurney, Thompson, Gavit, Walker, Burgess, and many others.

I will here state a few things in reference to the *present state* of my discovery.

First, I meet with many little difficulties, but thus far they have been of a character analagous to those of a beginner in Daguerrean manipulation, and arise from the same source, viz: a *want of experience*, in this *new branch of operating*. Many difficulties I have entirely overcome, and others must yield to my *perseverance*, for I make no claim to superior skill.

Second, the yellow rays do not comport with the other rays—yellow appearing a *buff.* By using a yellow glass in a part of my process, and exposing the plate under it to diffuse light for a few moments, I have succeeded perfectly in developing, by a subsequent process, a bright and beautiful yellow. Even this simple plan is attended with difficulties.

Third, I obtain all my impressions in the camera in *less time* than is required for Daguerreotyping; but I have recently found to my satisfaction, that by a slight variation in the process, I can work much quicker. For example, I have a most exquisite type of my little girl, (one year old,) taken in the act of *crying*, the plate not

having been exposed a full second. At the same time my light required 15 seconds for a Daguerreotype. This picture has caught the expression perfectly, both of the eye and whole face. On one cheek is seen a bright tear drop, and the *color showing through it much deeper than the surrounding parts*, which latter, I suppose, is owing to the refractive action of the fluid. My experiments in quickening, were broken off some three weeks since by an inflamed eye; but as I am getting well, I shall lose no time in pushing on to completion, and I do most confidently expect to be able to work instantaneously.

I am *fully resolved* to carry my process *as far as I can*, before making it public. Till then, all will be kept a profound secret. My wife and myself alone know the process, and not a scrap or item shall ever be communicated until I am made *perfectly sure* of a suitable compensation. I am a poor man, and need it; and if I cannot obtain a patent without incurring the risks of former inventors I have a plan by which I can secure my rights. The *process shall not be monopolized by a few;* but I intend to give all worthy Daguerreotypists a chance, and that on *liberal terms.* The above statements are made that my Daguerrean brethren, who see fit to communicate with me, may know my determination, and not urge me to a contrary course, as I wish to keep my mind as free from confusion as possible.

In conclusion, allow me to say that I am much, very much indebted to several distinguished artists in Philadelphia, and elsewhere, who have visited or corresponded with me, for the warm interest they have evinced in the matter. To the fraternity at large I am under great obligations for their having so liberally patronized my publications on the art, and I shall probably ere long issue another volume (to aid me in my experiments,) in which more full particulars of my process will be given.

Wishing you, Mr. Editor, every success in your important publication. I remain,

Yours truly,

S. L. Hill.

***Westkill, Greene Co., N. Y. Feb. 4th,* 1851.**

From the London Art-Journal.

THE WORLD'S FAIR OF 1851;*

ITS ERRORS AND ITS DANGERS.

The mode resorted to for raising monies has been much and severely commented upon. Without by any means going so far as a gallant member of the House of Commons, in asserting that "the promoters of this delusive undertaking were not content with begging, they also resorted to intimidation"—an assertion reiterated by Lord Brougham in the House of Lords,—we must admit that a course has been generally pursued by the subordinates of the Commission very discreditable to the national character. This has been caused principally by employing collectors, who receive a per centage upon all sums collected, and who are by no means nice in their arguments to persuade people of the wordly wisdom of appearing upon subscription lists.† Add to this an unbecoming

* Continued from No. 1, page 58.

† The authority upon this matter who will claim most attention is Sir Frederick Roe (formerly one of the metropolitan magistrates); in a letter inserted as an advertisement in the Times, he thus writes:—"During the spring of this year I have frequently conversed with many of my neighbors carrying on business in St. George's and St. James's parishes, and others residing in more distant quarters, on the subject of the projected exhibition. It is not necessary for my present purpose to trouble you with their views at any length, it is quite sufficient to state that a very considerable number —I should be afraid to state how many, assured me that they were decidedly opposed to it; but

suggestion of a respected journal (with which a member of the executive is known to be intimately connected), that if people would now put down their names for certain sums they need not be called upon to pay for some months to come—*i. e.* that they should have nine months' credit; and a most unseemly rumor that a certain wealthy peer, in gratitude for the honor recently conferred upon him, meant to draw his purse strings, and make up whatever deficiency might be found between amount subscribed and amount expended; consider the pitiful resource of "Benefits" such as that at Sadler's Wells; and we cannot avoid arriving at the conclusion that money was to be got *by any means;* and that thus our national character has been in no small degree humiliated, by the very circumstances which should have elevated it in our own opinions as well as in the estimation of foreign countries.

Far better, far more straightforward, and far more worthy of England would it be at once to declare, that having issued invitations to our table, there should be no lack of entertainment; that the National fund would supply the National Exhibition. To this complexion must we come at last; and it is right as well as wise to avow it. *Parliament will be called upon for a grant to make up the deficiency;* and so it ought to be; the very foundation of a cause for holding this Exhibition is that it will greatly benefit Great Britain. If so, the country should pay for it; if otherwise, it ought not to be holden at all. There is no reason why private subscriptions should not be asked for, inasmuch as some persons will be more advantaged than others by the issue, and a tax for the purpose would affect all alike; but there can be no just cause why a National benefit should not be purchased out of the National resources—*as it must ultimately be.**

We are told, indeed, to believe that the receipts of the Exposition will be large. Large they ought not to be. These receipts are to be derived solely (so it is understood at least), from admissions at the doors. There are to be no charges for space; or

that such had been the canvassing of powerful and distinguished persons, such had been the influence used, such had been the threats of withdrawal and loss of custom, together with menaces of having their names reported in the highest and most influential quarters if they refused to contribute, that with the conviction they were giving their money in support of a mischievous and suicidal measure, they did not dare refuse."

* The Times has given an estimate of the probable expenses and receipts of the undertaking—receipts arising from subscriptions and admissions, and makes the balance against the receipts amount to £35,000, "*a balance for the consideration of the House of Commons,*" but this appears to us to be under-rated; the Times gives the receipts from subscriptions at £60,000; there will be nothing like that sum clear of expenses incurred up to this date, to say nothing of salaries to be due between this and the 1st of May next, and other items of expense, omitting all consideration of Messrs. Munday's claim for "compensation." The cost of "the executive," the three secretaries, and the various other "officials," for the two years of their services, will not be less than £30,000,—a sum which the Times has not taken into consideration.

We have ourselves made a calculation of the probable receipts and the probable expenditure. It has not been made lightly, but after closely looking into the subject, and very minute inquiries of persons whose opinions were safe for guidance. It is as follows:—

PROBABLE RECEIPTS.	£	PROBABLE EXPENSES.	£
Private subscriptions,	70,000	Prizes,	20,000
Admission of one million persons at 1s. each,	50,00	Munday claim,	12,000
		Per centage (15 per cent. allowed by the Commissioners) on 70,000*l.* collected	10,500
		Printing and advertising	3,000
[N. B. Probably the exhibition will be visited by more than a million of persons; but there must be some mode devised by which, during part of the time, less than 1s. will be the admission fee.]		Expenses incurred by missionaries to the provinces	3,000
		Executive com. (two years)	8,000
		Secretaries (3 y)	6,000
		Sec'ys, (London, Westminster, &c., and provincial and other assistants, porters, clerks, &c.	5,000
		Building	100,000
		Police, watchmen, servants, messengers, &c, during the exhibition.	5,000
	£120,000		£172,500

The Westminster Committee alone have employed for some six months six collectors at three guineas a week each. They now pay ten per cent on the sums collected; the other expenses, for printing, &c., must be considerable. A nearly

for any other advantage. The admissions will be very numerous, but the price of admission ought to be as low as possible, or the primary intent of the Exposition will be defeated. The scheme is designed mainly to instruct our artisans. It is not intended as a show, or to teach the wealthy where they can get the best goods cheapest; the project was avowedly started—and upon that principle only was it encouraged by Prince Albert—as a means of improving those who were the actual producers of manufactured articles—in short, the working classes. Now, one inspection of eight miles of counters, foreign and home, will be of no sort of value to any artisan. He must study what he sees. He must go again and again; if possible, every day—as many days as he can, while the Exhibition is open; and if the admission on each day be one shilling, it will be a virtual exclusion of the classes for whose behoof the project was suggested, and has been supported. We desire the admission not to exceed threepence; if it exceed sixpence, the Exhibition for all useful purposes will be a nullity. It is already announced by something more than rumor, that on the first day, the private view day, the admission is to be one guinea for each person! It is not insinuated that visitors will on that day look at aught but the company; and it would be honest and manly to advertise at once, that those who pay this enormous sum will be admitted to a private view of——the Royal and Illustrious party who will be there "on that occasion only." Again, it is said the admission for the first week is to be five shillings—to diminish gradually until it reaches the minimum price. This project would be ruinous; it will be a death-blow to the vital principle of the Exposition, by doing away with that spirit of equality which forms its best recommendation; the aristocracy would go first, and the commonality follow. It would be, in short, the strongest move that has been yet made to render a mere phrase for laughter—that "dignity of labor"—about which so much was said, and so eloquently, by peers and prelates, who at the Westminster meeting sate side by side with shopkeepers of Oxford Street and Piccadilly.

similar course has been pursued throughout the country. We believe the most sanguine of the supporters of the exhibition expect that the subscriptions will barely suffice to meet the expenses, irrespective of the building, to be met entirely by the admission monies.

Our estimate, therefore, which we believe to be underrated, in all the items, leaves a deficiency of £52,000—*a deficiency "for the consideration of the House of Commons."*

Another paltry and un-English mode of making money, is understood to be by selling to the highest bidder the privilege to print catalogues; to be charged as a matter of course, at such price as the contractor pleases: to be executed, equally as a matter of course, in any way he likes. Upon this topic we shall have more to say when the subject is officially before us; but the contractor may rest assured that in this age of anti-monopoly he will not have the affair all to himself. "Competition" is the chosen motto of the Exposition of the Industry of all Nations in 1851.

If we are a nation of shopkeepers we are not a nation of beggars; and we shall enter our protest against being so described to the other nations of the world.

"They manage these things better in France!" The two Expositions of 1844 and 1849—which it was our lot to visit, and which are described so fully, and so extensively illustrated, in our Journal—taught us much, and ought to have taught as much to all who have been entrusted with the plans of the Great Exposition of 1851. The policy of England is indeed far more liberal than was that of France. We, who had so much reason to fear competition, boldly dared and chivalrously invited it; but if we scorned to imitate the French in the narrow and selfish view of "taking care of ourselves," we might at least have condescended to accept lessons from their experience in the business details in which they were proficients.

Their Exposition is paid for out of the public purse, and is *free* to all who seek it. Every day and all day long (for six days out of the seven) the high and the humble may study there. The catalogue is not cheap, it is charged 10d., but this evil is obviated to the humble, who can hire it for one penny a day. No mere vender of an article is allowed to exhibit it. When you see an article, you know by whom it is manufactured; you see nothing but what is French produce; it is only Frenchman competing against Frenchman

for the honor of France. He participates in the glory of the prize he does not himself receive, and he shares in the advantage of the custom thus obtained for his neighbor.

Neither in the Chamber, in the public press, in the atelier of the artisan, in the clubs or in the coffee-houses, is there ever heard a murmur against the cost of the building in the Champs Elysèe. It is paid for out of the National fund; it was so under the Monarchy and it is so under the Republic; but no one grumbles at a tax which he believes will be productive a thousand fold—not only in the actual sales effected thereby—but in the improvement of manufactures, by lessons given to manufacturer and artisan.

It is not yet too late; and earnestly do we hope that parliament may be applied to for a grant of money, *before*, and not *after*, the Exposition; to render it worthy a great country, and not to supply a deficiency, evidencing apathy or want of confidence; and that the people will be invited to see, *free of charge* (or at all events nearly so,) that which they will have paid for. It will be far more creditable and infinitely more profitable to do at once that which we have no doubt we shall be ultimately compelled to do—impose upon ourselves a tax to secure an Exhibition, in all respects, worthy; and we do not in the least doubt that such a proposition would be well received by the country, and not ill received by the House of Commons.

Surely we may not only imitate continental nations in the past, but in the present. France is not the only nation that will contribute a grant of public money, for the purpose of aiding its manufacturers and artisans to surpass the English in this very Exhibition, to be held in London in 1851. We have no doubt as the time approaches, every government in Europe, except our own, will have, so to speak, "taxed the people," in order to secure evidence of foreign supremacy in manufactured art; and it will be a shameful policy on the part of England if no encouragement is held out by our government of equal weight.

If then the blunders that have been perpetrated by commissioners, executives, and secretaries, have been so obvious, so numerous, and so utterly indefensible, we are compelled to believe that those to be committed hereafter will be as unpardonable in character and as disastrous in their effects. The difficulties to be surmounted have not in reality been yet met; we have but crossed the stile and struggled through the thicket which leads to the Slough of Despond; and we have neither Faith nor Hope to guide us among the pitfalls that encompass our path. Whose province will it be to determine where Mr. A. shall have his stall, and where shall be the stall of his rival in manufacture, Mr. B.? Who is to settle what amount of space shall be accorded to Mr. C.; and what articles shall be and what shall not be exhibited by Mr. D? What proportion of the judges will be foreign? What places in the Exhibition will be accorded to foreigners? Will the foreign manufacturer be enabled to exhibit through a London agent, and so make known to all inquirers where duplicates of his goods may be at once obtained? Where English patents have been used by foreign manufacturers, in part or in whole, will such articles be admitted, and who will bring such articles to the test? May dealers generally exhibit the objects they do not make but sell?—and if so, may a score or half-a-hundred of the very same objects be exposed on as many dealers' stalls? Who will be entrusted with the delicate and thankless duty of accepting or rejecting the various articles sent in? Even in France this is a task of great difficulty; and the moral machinery by which it is managed is by no means simple. Which of the Royal Commissioners will be daring enough to undertake it? Is this labor and this responsibility to devolve upon the Executive? If so, we anticipate what will follow. Especially, who will be the judges to make the awards—to award the medals and the prizes of twenty thousand pounds—of which by the way, we venture to prognosticate eighteen thousand pounds will go abroad! These duties must be discharged by persons of unquestionable integrity; and such persons it will be no hard matter to find: but integrity is only one of the qualities absolutely necessary to enable them to perform the work.

Above all, the determination of the Commission not to demand to know the quality in which an Exhibitor exhibits, will involve them in a maze, out of which they will never find their way.

A hundred other cases of difficulty present themselves to our minds; they might be overcome, but it can only be by confidence in the forethought, wisdom, and integrity of those whose duty it will be to encounter them.

We have thus said our say—it was a duty we imposed upon ourselves when we gave the Exposition our support; if we have either exaggerated or misstated, we shall gladly rectify the error; if our statements be arrainged, or our assertions contradicted, we shall endeavor to sustain them by proofs.

We tremble for the consequences that must be expected to ensue, burthened as we shall be with the weight of so many blunders; under the most favorable circumstances we have a contest to sustain against powerful opponents—opponents backed by the money of their respective governments, armed and trained for the contest by their sovereigns, with public feeling in their favor, and, it may be, old animosities stimulating the ordinary allurements to profitable rivalry; long experienced in all things appertaining to their several callings, knowing precisely what they want, and exactly where to find it. Could we hope for conquest? As well might we have looked for a victory at Waterloo if we had met the Old Guard and the legions of Napoleon with bayonets blunted and balls too big for the calibre of our cannon.

But if we knew we should be worsted in the contest, we expected that compensation for defeat which might have been better than a victory; and even some exasperation may be justified against a system of errors, which retaining all the disadvantages of the struggle, threatens to deprive us of all its advantages.

These disadvantages are not merely a diminution of public feeling, and a fierce array of hostility at home, but it is beyond all doubt that our manufacturers are arming as combatants reluctantly forced into the contest, and not as volunteers fighting for distinctions and rewards. We speak from positive knowledge when we assert that a very large proportion of these manufacturers are delaying preparations until they are better satisfied as to the result; and our dread is that they will so delay them until any attempt at competition will be useless. This, however, ought not to be; the manufacturers of Great Britain are, to use a common phrase, *in for it;* THEY MUST COMPETE; and under the very worst circumstances that can happen, they must not be held back from those exertions upon which their very existence depends—at all events for some time to come.

They must "be up and doing:" it would be idle now to counsel that *postponement* for a year, which we advocated some months back. They must be prepared by the 1st of May next; that is *now* the time fixed; and if altered (as we think it will be) it will only be by prolonging the period for another month, and if they have already lost much time, they have not another moment to lose.

To succeed in spite of obstacles is far more honorable than to prosper with all "apppliances and means;" and those who manifest energy and liberal enterprise must be regarded as patriots in the truest sense. We urge upon our manufacturers the duty they owe to themselves and their country; let them not relax because difficulties instead of being removed out of their way, have been created or increased by those who should have been their protectors. Difficulties are things made to be overcome!

With encouragement such as we had a right to expect, with time sufficient for all purposes, with judgment and equity evident in those whose arrangements and decisions must be of deep and lasting import, and with confidence in the Executive and officials of the Exposition, we might reasonably have hoped that British energy, enterprise, and capital, would have enabled Great Britain to make an appearance at "The Great Peace Congress of the World" worthy of her high renown; so that Peace might not take from her the laurels she had gained in War, at some period or other, from every nation of Europe and of Asia.

As these advantages have been denied to us, we must do the best we can without them, and the public may be sure, that, after all, the mighty resources of England will be largely exhibited; that its honor will be upheld, and its glory asserted in many important branches of the Industrial Arts.

GOSSIP.

We have been much more gratified by the reception of the first number of our journal than we anticipated, and under the circumstances we were better pleased with its general appearance than our most sanguine expectations led us to hope; but we think our second number, now before our readers, is somewhat of an improvement on the first, as we have had a better quality of paper made expressly for us. That our journal gives satisfaction beyond our hopes, we are satisfied by the rapid increase of our subscribers. We were backward in soliciting subscriptions before issuing our first number, and when it appeared we had but five; but since its publication not a day has passed that has not added three or more to the list; and that, too, without our using any of the ordinary exertions. We shall endeavor to merit a continuation of such prompt response on the part of Daguerrean artists.

—As there appears to exist some utopian views in regard to the utility of publishing portraits of Daguerrean artists in the journal, we would say a few words on the subject, in order that there may be no misunderstanding hereafter.

Our journal is established for the purpose of giving a new impulse to the art, and to unite the great body of Daguerreotypists throughout the country in bonds of brotherhood. We are taught by history that great deeds are engendered by bright and glorious examples, and that to excite the ambition to great and good deeds is honorable and praiseworthy. We are also taught that one of the best methods for exciting the ambition of man is to hold up to him the mirror of the past and present, wherein is reflected the names of those who have won imperishable honors in the pages of history.

Now, we conceive that every honorable branch of business may be elevated by the elevation of those characters who, in every way, tend to raise it in the estimation of the public—whether they be practical workers in the branches they may adopt for their livelihood, or only prime movers, directing, like skillful generals, the operatives in their employ. Like the hands of a watch they may not be able to tell the hour of the day, but like the spring, they can set those hands in motion, and by the superiority of their minds, which we may liken to the regulator, make them move with precision and accuracy. If we have any preference, however, it is for those who, by the force of their own natural ability, genius, taste and skill, and by the labor of their own minds and hands, make for themselves a name. We think none the less of him whom circumstances oblige to assume a secondary place in his sphere of labor; his genius is equally entitled to be held up to the admiration and praise of his fellow-man; and so far as the Daguerrean art is concerned, it shall be our pleasure as well as duty to draw from obscurity those who are thus circumstanced, that they may have oppertunities of having their claims properly canvassed and acknowledged.

It is our desire, and shall be our endeavor to render justice to all, and we pledge ourselves that nothing shall be admitted into our columns that may tend to depreciate the works of any artist; and no biography will be published in the journal, wherein the slightest allusion disparagingly of another artist is made. Whatever may be said of the artist whose biography accompanies the number, must rest with

his biographer, and although we may depreciate exaggerated accounts, which we trust no one will attempt to give, we cannot lend ourselves as a vehicle for the abusive epithets of those who take exceptions to what they may deem such. If we should pursue such a course, there is not an artist who would not be subject to the spleen of a personal enemy ; for all know that there never existed that man who could be said to be without an enemy.

We consider it no disparagement that a man cannot perform mechanically what he can execute mentally. It is the mind and heart which stamps the genius of man, without their proper cultivation mechanical skill is a nonentity, a mere automaton—it is like the poor boy in one of Harrington's tales, who was "all ready wound up, and willing to work, if somebody would only set him a phizzing!"

Where a man possesses both requisites, he is to be looked upon as greatly favored, and his works should evince the genius bestowed upon him ; but if a man possesses but one, and yet with the disadvantages surrounding him, produces works equal in merit, it matters not wherein he is deficient, he is entitled to greater commendation.

We shall endeavor to divest ourselves of all personal preference, and as we are not aware that we feel the least unfriendly to any one, we think we can assure our readers that they may expect fair and impartial treatment on our part. We wish to impart a confidence in Daguerreotypists towards us, that will ensure their hearty co-operation, and we trust they will throw aside all personal feeling in the matter, and give us credit for the sincerity we actually feel in the expression of our sentiments.

We use our biographical department as a stimulant to ambition, not to excite the evil passions, and we feel assured that before many months pass away, our Daguerreotypists will acknowledge that our calculations, as to its efficacy in doing good, will be fully realised.

—Since our last gossip, we have received a letter from Mr. S. L. Hill, in relation to his colored Daguerreotypes, in which he promises to show us shortly some specimens of his wonderful discovery. There seems to be no doubt that he has in truth made the great discovery of producing the Daguerreotype picture on the plate in all the brilliancy of its natural colors, a result for which all the most profound philosophers of Europe have sought in vain—unless the reward of six thousand francs, offered last summer by the government of France, has stimulated to success, within the time allowed, some one of the French *savans.* Those who have, for the last three years, derided us for our belief in the possibility of such an event may now hang their heads, and permit us, good humoredly, to exult over them. If he has succeeded in impressing permanently but one color, he establishes the possibility of obtaining all. Mr. Hill is too positive in his assertions to be for a moment doubted. No man with one particle of common sense would endeavor to impose so egregiously on the public ; and Mr. Hill is pursuing a course which must sooner or later gain him the confidence of his fellow artists ; and we not only congratulate him for his success, but take the responsibility of thanking him for the whole country. For, if he has made the discovery he claims, he deserves not only the thanks of every true American, but a most princely reward ; on the other hand, if it is designed as a mere catch-penny affair, his punishment will be equally just, and he should receive the execration of every honest man ; but the

course he is pursuing, gives us much more confidence in the discovery than any other he could have adopted. It is Mr. Hill's intention to take out a patent, yet act liberally towards his fellow artists. He is determined that it shall not be used as a monopoly. We trust, however, that the United States Government will prevent the necessity of a patent to protect Mr. Hill's right, and will follow the example of the French, purchasing it for the benefit of the whole world, and we hope Mr. Hill will offer it the opportunity.

—We find the following in the Scientific American; it is worthy the attention of our artists:—

"New Discovery in Daguerreotype.—At a recent meeting of the Paris Academy of Sciences, M. Regnault read a communication in which it was stated that a skillful artist, named M. Laucherer, of Munich, whitens the sides of his camera obscura, in order to obtain greater sensibility of expression. M. Blanquart Evard, of Paris, has made a number of experiments, in which he has ascertained, contrary to what has been the opinions heretofore on the subject, that the black coating inside of all the cameras now used, to prevent the reflection of light, lessens the photogenic action on the prepared plate or paper. He has, therefore, lined the sides of his camera with white paper, and given the interior of his tube a white coat, at the extremities of which are the two object glasses. With the above alterations in his instrument, he has experimented on the silver plate, albumenized glass, and on paper, and he states that the image forms in one half the time required in the blackened camera, that it is formed by light insufficient to give an image in the usual camera, that the action is more uniform—the light parts not disappearing before the shaded parts are fully impressed—and there is far less resistance to photogenic action in red, yellow, and green colors. We hope that some of our artists will try this alteration in their instruments, and give us the results."

—That the Daguerreotyping art is gradually drawing more and more the attention of the public, and more particularly the learned, towards itself, is very evident from the frequent notices it receives from the most respectable and influential journals and newspapers. "Arthur's Home Gazette says:—

"Little as may be thought of the art of Daguerreotyping, still it is one of the greatest inventions of the age; and simple as the process now appears, it involves a radical principle in science which is destined to work out and lead to the discovery of great and wonderful phenomena of nature. Already its powers have been extended so far as to take correct impressions of the most distant objects, placing before us distinct outlines of things which space presented in a feeble and scarcely discernible light. This is proved by the fact that Lyra, a star 'far out on the verge of the horizon,' not long since was daguerreotyped by that proficient in the science, Mr. Bond, of Cambridge Observatory. This star is not, at some periods, visible to the naked eye. Now, we are taught in philosophy that, though light flies at the rate of 190,000 miles in a second, it would occupy a space of more than twenty years in passing from that star to the earth. By making minute calculation then, we find that the ray of light which made the first impression on the Daguerreotype plate, must have started from the star more than twenty years ago, a long time previous to the invention made by Daguerre. Every principle of natural science, if we trace it to its original source is equally astonishing, and calculated to awaken deep investigation."

—The experiments of Mr. John Roach, optician, of New York, in the art are interesting, and we are at a loss to find reasons for his not oftener giving them publicity. He may be assured we shall not permit his "concealing his talent under a bushel."

— The following little poem has been so much admired, that, although it has been frequently published, we cannot refrain from giving it a place in our columns:

THE BABY IN DAGUERREOTYPE.

BY MRS. ANNA L. SNELLING.

WHAT! put *her* in daguerreotype,
And victimize the pet!
Those ruby lips, so cherry-ripe,
On lifeless silver set!

The frisking, laughing, bouncing thing,
So full of life and glee—
A restless bird upon the wing—
A sunbeam on the sea!

Put shadows on that forehead fair—
That look of quick surprise—
And give a dull unmeaning stare
To those blue laughing eyes!

Now, do you think a chance you've caught?
Out with the colors quick;
She's screaming at the very thought
Of such a shabby trick.

Now she is still—fly to the stand;
The smiling features trace!
In vain—up goes a tiny hand,
And covers half her face.

Give up the task—let childhood be
Nature's own blooming rose!
You cannot catch the spirit free,
Which only childhood knows.

Earth's shadows o'er that brow will pass,
Then paint her at your will;
When time shall make her wish, alas!
She were a baby still.

— As there seems to be a spirit of disgusting misrepresentation and envious backbiting prevalent on the part of a few—who are too insignificant for notice, otherwise than as one would notice a noisy puppy—in regard to our Journal, we take the liberty of publishing the following note in answer to our request to Professor Draper to become a correspondent.

University, New York, Nov. 24, 1850.

DEAR SIR—It will give me pleasure to comply with your request respecting your proposed Journal. I must defer this, however, till after the College Session closes, for my time at present is fully occupied in giving two and sometimes three lectures a day. Wishing you every success, believe me, yours truly, JNO. W. DRAPER.

MR. H. HUNT SNELLING.

— We also understand that some very good-natured friend is endeavoring to injure us in the estimation of Daguerreotypists by insinuating that we make a charge for the insertion of our biographical sketches. This is as false as it is base. We charge nothing—we do not even give *puffing* paragraphs of artists for the sake of their *subscription money.* We have a higher aim in giving these sketches than a mere paltry money consideration. They never can, and we never anticipated that they would be of the slightest benefit to our Journal, and we publish them—as we have said before—as a stimulant to the Daguerreotype community at large. There may be a few narrow minds that cannot see the force of this philosophy, but we have full confidence that the more thoughtful will appreciate it to its full extent. As to the idea of our being too partial, that is too ridiculous for a moment's comment, further than that it gives us an opportunity to assure our readers that in assuming the editorial charge of the Journal, we resolved to be just, conciliating and friendly to all alike. Our intention to publish biographical sketches of American Daguerreotypists were before the public, in our circulars, for three months previous to the issue of our first number, and Mr. Brady evinced good sense and sound judgment in taking advantage of the first issue. Our Journal is not confined in circulation to Daguerreotypists. We distributed a large number of our first issue among non-professional gentlemen and ladies, and shall continue to do so in future, for the benefit of the art. This must produce a good effect among

our citizens, and be advantageous to all who advertise, or publish their biographies in the Journal, at the same time that it will raise their ambition to strive for greater improvement.

—To the many requests for the purchase of single numbers of the Journal we must answer that we cannot consent to peddle our work like needles and thread about the streets. Such a course may answer for the cheap novels daily issued from the press, but it is too paltry and undignified for a scientific magazine, and withal, too troublesome. We will, however, state —as it is not in the prospectus—that subscriptions will be received for six months, or even three months when the artist is not permanently located.

—We feel that we have been somewhat severe in a portion of our gossip, but we think the occasions make it our duty to be so in our own vindication. Probably, if we knew the authors of the slanders alluded to, we should treat them with silent contempt, but we wish them to understand that we cannot be driven into a sycophantic course to please any class of men. Here we shall drop the subject for all future time, wishing our friends all the prosperity that can be crowded upon them.

—We would call the attention of our subscribers to our list of premiums announced in our prospectus. To those who may feel disposed to compete for the picture prize we will say, that they may depend upon no partiality being shown, for we shall appoint men of high standing, in no way connected with the art, and whose judgment will be exercised in the most impartial manner. We shall publish the names of our prize committee in our next.

—Our artists who intend exhibiting at the "World's Fair" will do us a favor by sending us their names, as we are preparing an article on the subject, and do not wish to neglect any. We intend sending a large number of the March issue to be distributed at the fair gratis, and we should be pleased to give a short sketch of each exhibitor. An early compliance with this request will greatly facilitate matters.

—We have the pleasure of announcing to Daguerrean artists, that we are now prepared to receive orders for our "*Improved quick working camera box.*" Having had our invention thoroughly tried and become convinced of its practical utility, we now offer it with perfect confidence. This box possesses many advantages over the common box now in use. The three principal are the following.

By slight changes pictures may be taken with it instantaneously, or in from half a second to three and four.

It reverses the picture on the plate so as to bring it in its natural position.

Dust can be more easily excluded.

And it can be used with any camera tube, either $\frac{1}{4}$, $\frac{1}{2}$, or whole size, dispensing with the necessity of a quick worker which can only be obtained of one size.

The price of the box will vary with the size and will probably cost no more than a Voigtlander 4-4 tube for the whole size—the quarter and half being in proportion. A full history of the improvement, with the price for each size, will be given in our next.

This box can also be used in galvanizing plates.

— Crayon Daguerreotype.—Having noticed an article in which this invention is attributed to the wrong source we insert the following from our "History and Practice of Photography.

It is the new invention of our countryman, J. A. Whipple, Esq., of Boston, who has it patented. It will be seen, however, from the previous pages of my work that Mr. Root is mistaken in regard to his being the first improvement patented in this country, although it is unquestionably the first by an American. Of this impovement Mr. Root says:

"The improvement to which you refer is denominated "The Crayon Daguerreotype." This invention made by Mr. J. A. Whipple, is the only improvement in Daguerreotyping, I beleive, for which Letters Patent for the United States were ever issued. The pictures produced by this process—which is of the simplest description imaginable—have the appearance and effect of very fine "Crayon Drawings," from which the improvement takes its name. Some of our distinguished artists have given it their unqualified admiration. Among them, our Mezzotinto Engravers, especially John Sartain, Esq., who, from his rich embellishments to most of the leading Magazines and Annuals of the country, as well as from the celebrity of the superb Magazine which bears his name, is so well known and so well qualified to judge of its merits. As an auxiliary to the artist in furnishing heads to the Magazines or other works, it is invaluable; the great object which it accomplishes being to give a finer effect and more distinct expression to all the features—the whole power of the instrument being directed to, and confined to the head.

"The late hour at which this subject has been brought to our notice prevents so full a description as we would otherwise have been glad to furnish. The New England States have been disposed of; negotiations for any of the others can be made through M. A. Root, 140 Chestnut street, Philadelphia.

"A series of beautiful portraits are about being prepared by the "Crayon Process" for the express purpose of being placed on the exhibition at the "*Art Union*," when amateurs, artists, and the public generally will have an opportunity of witnessing its effect. We are especially gratified with this striking improvement, from the advantages which it promises to the Daguerrean art.

"It is admirably designed to excite a new interest on the subject through the community, and in this way—and from its tendency to render the art more generally useful, and to elevate and distinguish it—to make it to all a matter of more general importance. Yours respectfully,

"M. A. Root."

— As several queries have been made in regard to clubbing, we will state, that we will furnish five copies of the Journal to any one address for twenty dollars.

— We understand that Mr. C. C. Harrison has invented one of the most complete buffing wheels of any yet got up. We hope the rumor is untrue that the principle has been seized upon by others and wheels made and sold in advance of Mr. Harrison's patent, for of all the most contemptible transactions this pirating the labor and inventions of others is most despicable.

— We hope our friend, D. D. T. Davie will not forget his promise. We have been looking forward to the time with much interest, and we are sure that his Daguerrean brethren will be equally interested as well as obliged to him.

— We are willing to pay a fair consideration for communications tending to improve the artist in his manipulations, where such communications develope any new principle, discovery or chemical invention. We shall also be happy to notice new inventions of machinery and have them properly illustrated.

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Gabriel Harrison

THE

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RESEARCHES ON LIGHT.*

BY ROBERT HUNT,
Secretary to the Royal Polytechnic Society.

PART I.
The influence of the Solar Rays on compound bodies, with especial reference to their Photographic application.

SECTION I.—*On Metallic Compounds.*

TARTRATE OF SILVER —This salt, whether prepared from pure tartaric acid, from the tartrate of potash, cream of tartar (bitartrate,) or from Rochelle salt (tartrate of potash and soda,) appears at first to change, but very slowly, under the influence of solar emanations; but after a short period the darkening process is very much accelerated, and the paper prepared with this salt, assumes a much higher degree of blackness, than almost any other of the argentine preparations. For copying engravings, or botanical specimens, it possesses some advantages; but I have never found any combination of the tartrates and the salts of silver, sufficiently sensitive for use in the camera obscura.

PRISMATIC ANALYSIS —The results obtained by Sir John Herschel are so very curious, that I shall take the liberty of transcribing nearly his own words. The kind of paper employed by this distinguished philosopher was thus prepared:—"1st, Nitrate of silver, S. G. 1·132; 2d, Saturated solution of Rochelle salt; 3d, Nitrate of silver, 1·132; which proving but little sensitive, a third wash of the nitrate was added, by which its sensibility was materially increased, its other qualities remaining unaffected. The spectrum impressed upon this paper commenced at, or a very little below, the mean yellow ray, of a delicate lead color, but faint and dilute; and when the action was arrested soon after the first impression was made, such was the character of the whole photographic spectrum. But if the Light was allowed to continue its action, there was observed to come on suddenly a new and much more intense impression of darkness, confined in length to the blue and violet rays; and what is still more remarkable, confined also in breadth to the middle of the sun's image, so far, at least, as to leave a border of the lead colored spectrum traceable, not only round the clear and well-defined convexity of the dark interior spectrum at the least refrangible end, but also laterally along both its edges. And this border was the more easily traced, and the less liable to be mistaken, by reason of its singular contrast of color with the interior spectrum. That of the former, as was observed above, was lead grey: of the latter, an extremely rich, deep, velvety brown. The less refrangible end of this interior brown spectrum, presented a sharply terminated and regular elliptic contour, the more refrangible a less decided one." Sir John Herschel discovers three points of maximum intensity in this spectrum, situated about the least refrangible blue, the most refrangible indigo, and beyond the visible rays. In my note-book I have marked but two maximum points—one situated in the indigo ray, and the other at the edge of the most refrangible violet rays. Having attempted to explain some effects which I ob-

* Continued from No. 2, page 91.

served upon Daguerreotype plates, nearly corresponding with those just described, by a speculation similar in its general character, to that of this distinguished experimentalist, whose ideas on this subject I was not at all aware of until after the publication of my own, I shall again copy into my pages Sir John Herschel's own words:—

"It may seem too hazardous to look for the cause of this very singular phenomenon, in a real difference between the chemical agencies of those rays which issue from the central portion of the sun's disc, and those which, emanating from its borders, have undergone the absorptive action of a much greater depth of its atmosphere; and yet I confess myself somewhat at a loss what other cause to assign for it. It must suffice, however, to have thrown out the hint; remarking only, that I have other, and, I am disposed to think, decisive evidence, of the existence of an absorptive solar atmosphere, extending beyond the luminous one. The breadth of the border, I should observe, is small, not exceeding 0-5 or 1-7th part of the sun's radius; and this, from the circumstance of the experiment, must necessarily err in excess."

If paper prepared with tartrate of silver is allowed to darken slightly, and then washed over with a weak solution of the iodide of potassium, the darkening process proceeds with great rapidity, and a most intense blackness results.

If a paper prepared with the tartrate of silver as above is washed over, before exposure even, with a solution of the iodide of potassium, its sensibility is very much increased; and we find, by exposing such a paper to the prismatic spectrum, that a very different image is impressed. The impression does not descend below the green ray of the spectrum, but at that point a delicate blue or grey color is impressed; it rapidly darkens, and throughout the whole of the most refrangible rays a very intense blackness is produced, which penetrates very deeply into the paper. The darkening process is carried for a very considerable space beyond the last visible violet ray, but with a very diminished intensity. The least refrangible rays do not appear to act at all; or if at all, they assist in converting the whole of the tartrate into iodide of silver. We do not find any of those protected spaces in this spectrum which are observed in the photographic image received on the pure tartrate.

If the same paper is washed with the ferrocyanate of potash, its sensibility is also improved. The impressed spectrum in this instance, exhibits the maximum effect, about the blue and indigo rays; but it is prolonged through the mean yellow, down to even below the least refrangible red ray, though it is not extended so far beyond the visible violet.

It would only be unnecessarily complicating the subject, and swelling the size of this volume, if I particularised the effects produced upon all the salts of silver. Those already described may be regarded as types of all the others. The carbonate, sulphate, acetate, citrate, and oxalate of silver, all of them undergo a considerable, and a tolerably rapid, change under the influence of Light. In some proportions the oxalate exhibits a very high degree of susceptibility, and with this salt, the citrate and the acetate, the same double and triple maxima of intensity occur, when they are subjected to prismatic influence, as we have seen occurs with the tartrate.

Although I have passed over many of the salts of silver, without particularising the effects produced, I cannot refrain from calling attention to some few of the organic combinations. Benzoate of the Oxide of Silver dissolves pretty freely in warm water. A single wash of this renders paper tolerably sensitive. The pictures thus procured are fixed most readily by washing in warm water.

Benzoate of silver precipitated from the nitrate of silver by benzoate of ammonia, re dissolved in boiling water, and washed over good writing-paper, renders it moderately sensitive. The first action is far from being energetic, under the greatest intensity of Light; but after a short time the grey tint which is at first formed passes very rapidly into a beautiful deep brown. The benzoate of ammonia and the nitrate of silver in successive washes, has been repeatedly tried, but without having obtained any improvement in the result. Under this section I may place papers prepared with hydro-benzoinamide and nitrate of silver; with formobenzoate of silver; and the benzoate of hydruret of benzule and nitrate of silver, the results being very similar. It will be interesting, however, to de-

scribe the results of prismatic analysis upon two or three of these preparations.

Prismatic Analysis.—Benzoate of oxide of silver. The action of the prismatic spectrum is first evident in the mean blue ray, from which it slowly extends upwards in nearly uniform force to the upper edge of the indigo ray, beyond which it rapidly diminishes in intensity. *The space occupied by the invisible chemical rays is maintained, even during prolonged exposure, much whiter than those parts of the paper under the influence of the diffused light.* This is the first instance in which the most refrangible rays have been observed to exercise the same kind of influence, as the least refrangible rays have been described as doing. Below the blue ray, the action extends to the lowest edge of the green ray, beneath which no evidence of change can be detected. Hence we have a spectral image, which is confined to a space but little more than one half the length of the luminous spectrum, if we except the portion occupied by the extra spectral violet rays.

Formobenzoate of Silver.—The action of the spectrum in this instance is also seen to begin about the region of the mean blue ray. It goes on with apparently equal energy down to the yellow ray, and is tolerably active to the upper edge of the orange rays. Washing with the hyposulphite of soda, however, shows a well defined line of maximum intensity, which exactly corresponds with the least refrangible blue rays. Above the blue, the action is powerfully exerted through the indigo rays, after which it declines in energy, but it is continued beyond the visible violet, over a space quite equal in extent to that of the visible violet rays.

Benzoate of Hydruret of Benzule and Nitrate of Silver.—The chemical change on this preparation commences at the limits of the green, and reaches its maximum at a point corresponding with the mean blue ray, after which it gradually diminishes, and any visible effect ceases just beyond the most refrangible violet rays. The rays below the green appear to be quite inactive. This spectral impression is scarcely more than one half the length of the visible spectrum.

It has been before stated, that Gallic acid had the power of calling forth the dormant images from these combinations of benzoine. I merely recur to it to state, that it will be found, on washing over any of these papers with this acid, after they have been exposed to the spectrum, that evidences of decided action will be observed over the whole of the space covered by the prismatic image. These facts are, in the present state of our knowledge, exceedingly enigmatical; but it appears to me, that by recording them, we advance step by step towards the development of some important truth.

It might appear, from the very unstable character of the combinations of cyanogen, that combined with the salts of silver, these would produce very susceptible photographic compounds. Such, however, is not generally the case. The pure cyanate of silver undergoes but very little change during an exposure of many days. The amazing sensitiveness imparted to the iodide of silver by the ferrocyanate of potash has been already spoken of. A weak solution of hydrocyanic acid produces the same effect, but in a much slighter degree.

If a solution of the red prussiate of potash is washed over nitrate of silver, we have a photographic compound of some interest. In about half an hour a very beautiful copy of a print may be taken. Over all the parts which correspond with the lights of the picture, Prussian blue is formed, which appears green when contrasted with the yellow of the paper. If a small portion of the protosulphate of iron is added, the blue produced is much more intense. This chemical change is, I find, brought about entirely by the blue and violet rays of the spectrum.

If chloride of silver is allowed to darken by exposure to sunshine, and is then washed over with a solution of the ferro-cyanate of potash, no very evident action is visible. If, however, this paper is exposed under a deep green glass, it will be found to bleach with some degree of rapidity. If exposed to a very concentrated spectrum, this bleaching power appears to be exerted by the yellow and green rays, whereas over the other parts, symptoms of darkening are sufficiently evident.

If by washing a paper, which has been saturated with nitrate of silver, with a solution of caustic potash, we cover it with an oxide of silver, or, still better, if, instead

of potash, we use ammonia, and then wash it with hydrocyanic acid, the paper is, of course, bleached in the dark, and the resulting cyanide of the oxide is readily blackened by exposure to the solar rays. This shows how very slight a difference in the manipulatory processes will change the character of a compound in its relations to light.

Chromate of silver, arseniate of silver, and some other salts have been described as absolutely unchangeable by Light. Experience has, however, shown that this is not the case, as a very sensible change takes place, either after a short or long exposure, upon all the salts of silver yet examined. The chromate of silver does not change much in color, even after an exposure to good sunshine for many days, but it eventually assumes a very metallic brown shade, and revived silver is readily detected. Under certain circumstances, the arseniate becomes really a very good photographic agent, and I find that paper washed with the *liquor arsenicalis* of the Pharmacopœia (a solution of arsenic in water, assisted by the presence of some potash), and then with nitrate of silver, changes with tolerable readiness, and darkens to a tolerably jet black. The photographs resulting from this process are really the most decided in their contrasts of light and shadow, of any procured with the argentine preparations.

I have now to consider, which I shall do very briefly, the effects of other metallic preparations in combination with the silver salts. Sir J. Herschel was the first who examined this matter, and he found the combinations of the salts of lead and silver produced papers more sensitive than the silver alone. The use of lead was however abandoned, owing to the discoloration which went on in the dark, with greater or less rapidity, over the papers impregnated with its salts. Both gold and platinum, I have found, interferes with the change set up by luminous agency on the salts of silver; and where, even by using a large excess of the silver salt, a good photograph is procured, the gold or platinum still continues to exert a decomposing power in the dark, and eventually destroys the picture. At one period I was inclined to think the presence of copper with the silver was detrimental; a rather extensive series of experiments, have, however, shown me that a small quantity of any of the soluble salts of this metal, rather quickens than retards the change in the argentine salts. A large portion of copper certainly lessens the sensitiveness of the silver preparations, and has a tendency to destroy the paper. Iron has a decided property of accelerating the process of change; but it unfortunately keeps up the darkening influence when once set agoing, even when preserved from the light, and consequently it cannot be used with any advantage practically. When we come to the consideration of the effects produced upon these metals and others, I shall have to point out some very striking properties of the salts of silver, which do not properly find a place here.

CHAPTER II.

Preparations of Gold.

It has long been known, that an etherous solution of gold, decomposes by exposure to the sun's rays, metallic gold being deposited on the side of the vessel nearest the light. Charcoal saturated with a solution of the chloride of gold, and exposed to the sun's rays, is speedily covered with a very fine film of the revived metal. Ivory may also be gilded by washing it with the same solution and exposure. Most of the salt of gold, indeed, are reduced by solar agency.

Sir John Herschel, in the Philosophical Transactions, Part I. for 1840, has given some very interesting particulars respecting some aurated preparations :—

Papers washed with chloride of gold, freed from an excess of acid, are slowly changed under the influence of the solar beams, a regularly increasing darkness takes place, and the paper at length becomes purple. (*Herschel.*) I have observed that the first action of the Light is to whiten the paper, which has been rendered a pale yellow by the chloride. If papers are removed from the light when thus bleached, it will be found that a darkening action will gradually come on, and eventually develop the picture, which may be impressed on the paper. This process is much quickened by placing the paper in cold water.

Chloride of gold with nitrate of silver gives a precipitate of a yellow brown color,

possibly metallic double salts, in which the gold as well as the silver is in the state of chloride. On glass this precipitate is but very slightly sensitive, on paper it is blackened somewhat more speedily, (*Herschel*).

If paper impregnated with oxalate of ammonia be washed with chloride of gold, it becomes, if certain proportions be hit, pretty sensitive to Light, passing rather rapidly to a violet purple in the sun. (*Herschel.*) I have found it exceedingly difficult to arrive at the best proportions: generally speaking, thirty grains of the oxalate of ammonia, and a saturated solution of the chloride of gold, has been the most successful in practice. These papers must be dried in the dark without heat. After the picture has been obtained, I have succeeded in fixing it, by soaking it in cold water, and then washing it over with the ferrocyanate of potash.

Paper impregnated with the acetate of lead, when washed with perfectly neutral chloride of gold, acquires a brownish-yellow hue, and a sensibility to Light which, though not great, is attended with some peculiarities highly worthy of notice. The first impression of the Light seems rather to whiten than to darken the paper, by discharging the original color, and substituting for it a pale greyish tint, which by slow degrees increases to a dark slate color; but if arrested, while yet, not more than a moderate ash grey, and held in a current of *steam*, the color of the part acted on by Light (and of that only) darkens immediately to a deep purple: the same effect is produced by immersing it in boiling distilled water. If plunged into cold water, the same change comes on more slowly, and is not completed till the paper is dried by heat. A *dry heat*, however, does not operate this singular change. (*Herschel.*)

Prismatic Analysis.—*Chloride of Gold.* The maximum effect is produced by the mean blue ray, and the influence is exerted but a little way below the green; indeed, it is doubtful if it can be said, that any visible effect is produced below the green itself. Above the blue the action is carried on, but with declining energy, through the indigo and violet rays, beyond the most refrangible edge, of which no action can be detected.

To distinguish the following processes from the Chrysotype, which will be described in another section, I propose to designate them as *Aurotypes*.

Aurotypes.—Protocyanide of potassium and gold, prepared according to Himly's method, was washed over paper and dried; then it was washed with a solution of the nitrate of silver, and again dried. This paper darkens with considerable rapidity, and this blackening proceeds steadily in the dark. Good photographs result from this preparation. The pictures are best fixed by soaking in a little salt and water, and then washing with a weak solution of the hyposulphite of soda.

It will be found that several of the combinations of the oxide of gold with cyanogen yield very interesting pictures, which promise to be of some importance in the photographic art. A few of these may be briefly mentioned.

(*a*) Protocyanide of potassium and gold, with a weak wash of nitrate of silver, changes with tolerable quickness, and presents a good contrast of light and shadow.

(*b*) Protocyanide of gold, formobenzoic acid, and nitrate of silver, give very beautiful results, and are tolerably quick in changing, although as yet no paper has been prepared, sufficiently sensitive for use in the camera obscura. The darkened portions are exceedingly intense, the impression being made nearly through the entire substance of the paper; hence affording very perfect photographs, from which copies of exceeding sharpness may be procured.

(*c*) Protocyanide of gold, formobenzoate of ammonia, and nitrate of silver, give results of an exceeding pleasing kind. Papers thus prepared do not appear to be quite so sensitive as those which are prepared with the formobenzoic acid, but they are sufficiently so for copying engravings in good sunshine.

(*d*) Nitrate of silver, protocyanide of potassium, and gold. A very delicate picture results from a short exposure to sunshine, which continues to darken without the aid of Light as long as any portion of gold remains undecomposed. It is a peculiar property of all the salts of gold, that the darkening process once set on foot is carried on in the dark as long as any gold remains.

Prismatic Analysis.—The following results obtained upon several different pre-

parations, will serve to exhibit most of the peculiarities which mark the influence of the solar beam on auriferous preparations.

On paper prepared as above *a*. the maximum of action is far down in the blue rays nearly on the verge of the green. After a few minutes the action is extended, through the green ray to the very centre of the yellow ray. Towards the most refrangible end, the action is tolerably uniform through the whole of the blue and indigo rays; it slowly declines through the violet; but it extends with some considerable power over a space beyond the visible spectrum, equal to a third of its entire length.

A paper washed with the protocyanide of potassium and gold, between two washes of the nitrate of silver, exhibited the maximum of intensity on the very edge of the least refrangible blue ray. The darkening process was carried on, down to the edge of the orange ray, below which no action could be detected. Above the blue rays the influence became gradually weaker, and faded away entirely at a point beyond the violet rays, distant from the visible ray about the width of the violet rays themselves. No action could be detected at the least refrangible end of the spectrum.

A paper prepared as described *b* was acted upon with much energy. The maximum of action was in the mean blue ray, and a well-defined line marked the least refrangible edge of the rays. The influence was, however, extended to the centre of the yellow ray, the action over the space occupied by the green ray being exceedingly well defined. At the most refrangible end the action was exerted with great energy up to the extreme edge of the visible violet rays, from which point it gradually declined until the darkening entirely ceased at the extremity of a space beyond the violet, quite equal to half the length of the luminous spectrum. This paper had browned a little by keeping. This browning was entirely removed by the influence of the red rays, and to some extent bleached by all the rays along their lateral edges, presenting a similar phenomenon, to that already described, as observed by Sir John Herschel on the tartrate of silver, and by myself on Daguerreotype plates.

A paper prepared with a neutral solution of the chloride of gold, ammonia, and nitrate of silver, still exhibited the maximum effect in the mean blue ray, the darkening extending, however, with tolerable strength to the lower edge of the green rays, which impresses a decided green color on the paper. The influence proceeds pretty equally through the blue and indigo rays; it diminishes through the violet, and ceases to act at the end of a space beyond the violet rays equal to three-eighths of the length of the visible spectrum.

A paper with protocyanide of gold, nitrate of silver, and ammonia, gave no evidence of any darkening action *within the luminous spectrum.* At the most refrangible edge of the violet rays, chemical action begins, and it rapidly reaches its maximum at a very short distance from it. A faint darkening goes on over a space equal to one half of the visible rays.

Papers prepared with the percyanide of potassium and gold, then formobenzoic acid and nitrate of silver, darken very rapidly over the whole extent of the most refrangible rays, the darkening commencing in the blue ray, and apparently going on through the whole period of exposure with greater energy about the mean ray of that color, than in any other part. The influence is exerted with much power down to the red rays, and a second wash of the nitrate of silver carries the action below them. Over the violet end of the spectrum a very beautiful purple-brown color is brought out, which fades into a lilac in the invisible rays which exert their power with some energy over a considerable space.

If papers are carefully prepared with the percyanide of potassium and gold, &c. as the last named, they will be found to be exceedingly useful. If the preparations are pure, and the proportions in good adjustment, the results are most satisfactory, and the photographs are amongst the most beautiful that can be imagined. My own results do not enable me to fix with certainty the best proportions in which these agents should be united. It however appears, that a saturated solution of the percyanide of potassium and gold, with formobenzoic acid, spec. grav. 1·12, and a solution of 100 grains of the nitrate of silver to an ounce of distilled water, are tolerably near the proportions required for the production of the most sensitive papers. I have, however, sometimes obtained very

beautiful photographs with these agents united in different proportions from the above.

The action of oxalic acid on solutions of the salts of gold has been long known to chemists. When a neutral oxalate is heated with a neutral solution of gold, metallic gold is precipitated. Light acts the same part as heat. If a neutral chloride of gold and oxalate of potash be washed over paper and exposed to the sunshine, a slight change is immediately produced, which, however, goes on darkening until it at last assumes a very deep hue. Sir John Herschel remarks on this peculiarity: "A stain is produced, which however feeble at first, under a certain dosage of the chloride, oxalate, and free acid, goes on increasing from day to day, and from week to week, when laid by in the dark, and especially in a damp atmosphere, till it acquires almost the blackness of ink, the unsunned portion of the paper remaining unaffected, or so slightly, as to render it almost certain, that what little action of this kind exists, is due to the effect of casual dispersed Light incident in the preparation of the paper. I have before me, a specimen of paper so treated, in which the effect of thirty seconds' exposure to sunshine was quite invisible at first, and which is now of so intense a purple as may well be called a black, while the unsunned portion has acquired comparatively but a very slight brown. And (which is not a little remarkable, and indicates that in the time of exposure mentioned the *maximum* of effect was attained) other portions of the same paper exposed in graduated progression for longer times, viz. 1^m, 2^m, and 3^m, are not in the least perceptible degree, darker than the portion on which the light had acted during thirty seconds only."

Gold is not only thus effected when in combination with other salts, but any of the preparations of gold having been exposed to solar influence go on "darkening spontaneously and very slowly, apparently without limit, so long as the least vestige of unreduced salt of gold remains in the paper." I find that on paper, after this decomposition of the chloride has been entirely effected, a change still goes on, and eventually a beautiful revival of gold gives a metallic appearance to the surface.

It has been stated, on the authority of Mr. Goddard, that a plate of gold is rendered very nearly as sensitive to luminous agency by the action of iodine vapor, as are the plates of silver used in the Daguerreotype process. I have not yet succeeded in rendering gold as sensitive as silver by either iodine or bromine; but it has been shown by Moser that all metallic plates are rendered to a certain degree photographically sensitive by being exposed to these vapors. On this subject some further remarks will be made in this volume.

From the American Artisan.

THE DAGUERREAN ART—ITS ORIGIN AND PRESENT STATE.

THAT which, within ten short years, was regarded as the wonder of the age, is fast finding the place of all truly great and wonderful discoveries,—that of universal enjoyment. When the discovery was announced, the artistic world was on tip toe. The great mass of the civilized family of mankind, educated as they had been in the wonderful exploits of art, gave full credit to the news. To the sun they gave a new attribute, and had it not been for the knowledge of Christianity, science and art, the discovery would have added millions to the worshippers of the material source of Light. But, under their enlightenment, they saw, and are now continually seeing, new reasons for praises to the Creator. Additional blessings are imparted to man's life.

The Daguerrean Art during the nine or ten years since its introduction into this country, says E. Edwards Lester, has advanced more rapidly toward perfection than any other art or science in existence.

" But probably no one of the fine arts, whose object is the representation of the human countenance, has ever had the misfortune to depend for its representatives, upon so incompetent a class of men as the Daguerreotype. Now we have no particular objection to anybody's trying to get a living even by multiplying samples of poor faces except in so far as they misrepresent a beautiful art which, in the hands of men of taste and genius has been carried to great perfection. In this, as in all other arts, the principle holds true, that inferior specimens create misapprehension and disgust for the genuine thing.

" And probably now, not one person in a thousand in the United States has the slightest conception how immeasurably superior the pictures of some of the Daguerrean artists in our principal cities are, over the common works which are daily brought to their view. There is as great a comparative difference between them, as there is between a portrait by Elliot, a landscape by Durand, or a historical piece by Huntington, and those common daubs which are daily brought under the hammer in our auction rooms, and gazetted as " works by the Old Masters.

" Without pretending to be very minute in details, we believe it was the year 1839, when the world was startled by the announcement, that Daguerre had made a discovery, by which views of scenery could be obtained by a mechanical process in the short space of twenty minutes. Shortly before the arrival of the first pictures taken by this new process, some of our scientific men had gleaned from the Paris journals a little information on the subject, and after discouraging failures, succeeded at last in producing the faint outline of a building. Professors Morse and Draper were engaged at the same time we believe in this experiment, and thus had the honor of taking the first Daguerreotypes in this country. As yet only inanimate, or objects of still life had been shadowed upon the silver plate; but subsequent experiments of these gentlemen led to the taking of likenesses, if such they might be called, for which persons sat twenty minutes in the full blaze of sun light, aided on either side by strong reflectors. Little if any doubt remains, that these were the first daguerreotypes ever taken. The art then in its infancy, has since been more indebted to these Professors for the results that have followed, than to any other men. Under their auspices, those persons received their instructions, who became in turn the teachers of all who are now practising in the art.

" Early in 1843, the practicability of painting or coloring Daguerreotypes was ascertained, by whom we certainly do not know; but one of its earliest applications was made by Mr. Washington Chilton of New York, and the first colored daguerreotypes were made we are informed by Anthony, Edwards & Chilton, at that time a very popular and successful house in this city. This constituted what may be called a new era in the art, as the chief objection of many, that daguerreotypes wanted the life-like hue of a miniature, was obviated. From that time till the present, rapid progress has been made by a few men of science, taste and industry, in every depart-

ment connected with the daguerreotype; and pictures are now produced, which for distinctness of feature and outline, brilliancy of color and tone, artistic arrangement and effect, rival the finest efforts of the most gifted pencil; while, as likenesses they are doubtless more perfect than ever can be traced by the human eye, or the human hand. Without wishing to detract from the merit of any man who is justly entitled to it, we may pay a well deserved tribute to those gentlemen who from the beginning have been sooner or later connected with the Chiltons in the improvement and perfection of the Daguerrean art. Mr. Edwards who was at one time an efficient member of the firm of Anthony, Edwards & Chilton, and, afterwards Anthony, Edwards & Clark, rendered great services to this cause; and, in his intense application to the pursuit, may be said to have fallen a victim.

"This art seems to have accomplished for the mass of mankind, in such matters, what was achieved by them in another way by the printing press. It has brought one of the great luxuries and embellishments of life, within the reach of everybody. The time was, when no man but a prince or a priest could own a Bible; now the blessed Word of God may lie upon the table of the poorest laborer. Once artists confined their labors to opulent patrons, and no man could be expected to transmit to his children his own picture, unless by incurring a large expense. Friends at a distance could not send to each other their likenesses, as memorials of affection except under peculiar circumstances. Now the poorest man can have the portraits of his children taken, and they become invaluable the moment they are dead. Friends, at their parting, to go on distant and perilous expeditions, can, in an hour, and at a trifling expense, multiply their portraits, and leave them to be gazed on by those whom they have left behind. Travellers and scientific explorers through new and unknown regions can bring back with them, by means of the daguerreotype, truthful illustrations of the architecture, the scenery, and the natives of foreign countries: wherever men wander over the face of the earth, it is possible, nay easy, to copy any scene which strikes the eye as new, grand or beautiful, almost with the rapidity of lightning. The Daguerrean art has already, in this manner, achieved much for science and still more for society. And although there are but few comparatively among those who prosecute it who are worthy of the name of artists, yet there are many in this country who are now taking better pictures than are taken even in London or Paris. Two years ago we saw a very large collection of Daguerre's best works, and we have no hesitation in saying that none of them were equal to the best daguerreotypes taken in America; and the collection, as a collection, was far inferior to many in this city; while Brady, Gurney, Morand, Haas, Lawrence, and others, have made far better pictures than Daguerre ever dreamed of. Indeed there are in the galleries of all these artists we have mentioned, and others in Boston, Philadelphia, &c., pictures which are so extremely beautiful, faithful, artistic, and effective, that we rejoice in the great success they seem to be meeting with wherever talent, efficiency, perseverance and science are combined."

[On the same subject we find the following article in the Sunday Courier. It is with pleasure that we view these evidences of the interest the art is exciting in all circles.—Ed.]

"Probably in no portion of this Western Hemisphere are there so many daguerreotype establishments, within the same space of street front, as along the Broadway limits of the Third ward. Some dozens of active operators, in as many establishments, promulgate their show-cases, all along the thoroughfare, and, probably, more pictures are taken within the locality than anywhere else in the world, in the same longitude of carriage-way. The business, so far as the manufacture of New York photographs is concerned, may be said to have had its origin in this part of the city, and among the earliest operators was Gurney, now at 189 Broadway. He has been engaged in this novel and interesting art since 1840, and has, probably, taken more *custom* pictures than any other one operator. He has three large rooms, on the third and fourth floors, and in his gallery may be found the representations of many of the most distinguished people of the day. Nearly all our prominent American citizens are there da-

guerreotyped, and a stroll through his apartments will well repay the time and trouble.

Mr. James Brown, of 181 Broadway, is another very promising artist,—a young man, but with great experience in his profession.

Mr. Brown was one of Brady's principal operators, and, joined to a well-trained judgment, he has much merit as a painter and draftsman.

Mr. Brown has furnished several spirited sketches for the Illustrated London News, and has likewise given us a number of those truthful heads of our Police Captains, which have made our Portrait Gallery a matter of so much interest. He is probably the only artist in the city who can successfully transfer his own photographs to the block, and we shall probably avail ourselves extensively of his services hereafter.

Also noted in their line, are Messrs. Mead and Brothers, of 283; White, of 247; Anthony of 205; Langenheim, 247, and Butler of 251 Broadway, formerly Plumbe's old establishment. Plumbe may be said to be almost the father of the Daguerreotype business in this city—and, at one time, he had operating offices in all the principal cities of the Union. His business became too extended for his supervision, and he finally became comparatively poor, with one of the most magnificent chances for a fortune in the world. His successor in the New York shop, Mr. Butler, was originally a clerk in the office of the Journal of Commerce, and, we believe, once a jour printer and sailor. His gallery is quite extensive, and, although somewhat antiquated, will prove quite interesting, there being many pictures of much merit.

With Martin M. Lawrence, of No. 203 Broadway, is an excellent young artist by the name of Gabriel Harrison, who is the principal operator in the establishment, and whose pictures are highly prized. We have seen some of his portraits of our female friends, which are truly superb.

M. B. Brady, of 205 and 207 Broadway, corner of Fulton, has, however, after all, the largest and most fashionable establishment in the city. His enterprise is proverbial, and his gallery of the members of Congress, noted military, naval, and civil officers, perhaps cannot be equalled. Brady is not an operator himself, a failing eyesight precluding the possibility of his using the camera with any certainty, but he is an excellent artist, nevertheless—understands his business so perfectly, and gathers around him the first talent to be found. His daguerreotypes on ivory have attracted considerahle attention, and they may, without flattery, be said to be the most magnificent productions of the art.

Note by the Editor.—We do not know where the eyes of our friend could have been when he wrote this article. They certainly were half closed or he would not have overlooked some of the most prominent artists whose names deserved recording.

We consider that Messrs Beckers & Piard of 201 Broadway; Powelson & Co. 177 Broadway; N. G. Burgess, 187 Broadway were equally entitled to his consideration.

We must also correct a few errors in his article. Mr. Anthony of 205 Broadway, is no longer a practitioner of the daguerrean art, having retired in 1847 and opened a depot for the sale of apparatus and materials for the use of Daguerreotypists.

Mr. White has also retired from the business, and so has Langenheim, their place now being occupied by Mr. D. E. Gavit from Albany who excels them both in the art of transferring the form of the human face to the silver plate.

PHOTOGRAPHIC RE-UNIONS.

BY THE EDITOR.

In the February number we endeavored to show the absolute necessity for the formation of an American National Photographic Society. By a National Photographic Society, we mean, one formed publicly by the great body of Daguerreotypists throughout the Union, not by a few interested individuals meeting in secret, forming their constitution in secret, and electing their officers in secret, and by this means arogating to themselves all the honors that may arise from the movement.

If we wish to secure a National Society, the movement must be a general one publicly made, in order that all, from one end of the United States to the other, who feel friendly to so important an object may be enabled to participate. This is the only way to prevent sectional jealousies or murmurings of sinister motives and proceedings.

It is our desire to see the formation of a Photographic Society effected in a manner that will give it permanence, stability and character ; in a manner that will leave not a single measure at which to cavil. We have understood that initiatory steps had been taken and several distinguished Daguerreotypists consulted in the matter, and that meetings were to be held for the purpose, but we cannot find, so far as our inquiries go, any who seem to know any thing about it.

If it is the intention of those engaged in this movement to keep it a profound secret until after the organization of the Society and thus debar all save a favored clique from participating in these initiatory steps, we predict that the wire-pullers of it will find that they have "built their house on sandy ground."

It is but right and proper that the movement should emanate from the highest authority, but it must be seconded by the mass. No particular set of men, no matter how high their station in their particular vocation, have any right to dictate to their brethren any peculiar constitution or set of laws for their government—at all events, not in this republican country. We are democratic enough in our principles to protest against any assumption of such power in every relation of government between man and man, and to insist, that, when any movement is set on foot for the benefit of any class of men, the whole of that class shall be called upon in a public manner, to participate and say how they shall be governed and by whom.

We are not aware that it is the intention of those who are said to be now engaged in the formation of a Photographic Society to pursue this course, but one of two things is most certain; either that such is their intention or that the scheme has fallen through from a want of proper energy on the part of the gentlemen referred to.

If the former is the case, we trust the gentlemen will pause for a time and canvass the matter well in their own minds before proceeding any farther, and not suffer ambitious motives of self aggrandisement to influence them. We have had opportunities of seeing several societies got up in the same spirit, and have as frequently had the pleasure of witnessing their downfall after a brief career—some of them very brief indeed. It is a bad foundation to build upon, and in this, as all other similar cases, the edifice will topple before the work is half accomplished, and tumble into total ruin before the last course is laid.

If want of proper energy is the cause of the silence and inactivity which has prevailed since the first and only announcement, we would say to the gentlemen either stand aside and allow others to take the matter in hand who may have the requisite abilities to prosecute the affair to a successful termination, or else throw off your inactivity, come boldly forward, and submit your propositions to the great body of American Daguerreotypists for their action in the premises, and do not skulk behind an impenetrable incognito.

The city of New York is not the only village in this little Republic, neither are the people thereof its entire population, and we see no reason why it should assume the right to dictate to any class of men beyond its limits.

In order, therefore, to make this movement a general thing among the Daguerreotpists of the *United States*, a call for a convention of all the operators from Maine to Texas should be made, to assemble by their delegates, at some central point, to deliberate upon, and discuss the most appropriate course to be pursued—form their constitution—enact their by-laws and elect their officers. Any other proceeding will only result in a local Society.

From the large number of resident Daguerreotypists—from its superiority as a commercial town—from the great influx of emigration—from its acknowledged position as the first of American cities—from its attractions as a place of resort—from its literary claims—from the ease with which it can communicate with all parts of the country—and from its position in the arts, New York is undoubtedly the most suitable place for the location of the executive officers of the Society, and we have no doubt of its superiority in this respect being accorded by any set of delegates that may be chosen to form a National Photographic Society.

In its organization there are many things to be considered which are of vital importance to its ultimate success and permanent existence.

None should be admitted to actual membership unless engaged at the time in the business.

The character of the applicant should be well canvassed. As we remarked in our former article, there are those engaged in the art who do not scruple to descend to the lowest acts of chicanery to obtain custom, or to prey upon the cupidity and ignorance of their fellow artists. Such men should never be admitted into the circle of any respectable society.

Every member should possess a certain degree of excellence in the art, and none should be admitted whose acts have a tendancy to depreciate the value of the Daguerreotypist's labor.

Honorary members should only be admitted for the aid they have rendered the art either scientifically or by personal influence.

These observations we merely throw out as hints, not in a dictatorial spirit. They are what we conceive—from actual observation—to be points for earnest consideration and should be weighed well in the adoption of a constitution.

The superiority of American Daguerreotypists over those of every other country is an acknowledged fact, and this fact causes the attention of all the greatest philosophers of Europe to be directed towards us with somewhat more intense interest than is generally vouchsafed to us by them, and as no one in this country has endeavored to elucidate the cause of our superiority, foreign writers have speculated with considerable jealously upon the subject. They seem unwilling to accord to us that skill which we actually possess, and seek any reason, but the right one, for that excellence in daguerreotypes they cannot avoid acknowledging, however reluctantly.

We are of the opinion that the Daguerreotypes which will be exhibited at the "World's Fair" will more than surprise them. They will be startled, and speculation will be more rife among them than ever. These remarks may be considered irrevalent to our subject, but we introduce them to show that we have something more to do, than take superior pictures in order to convince the world at large that that superiority is in fact owing to the rare individual skill, taste and talent of our operators.

Divided as our Daguerreotypists now are—each selfishly striving for himself only, and feeling in his heart a bitter envy and jealousy of all who are even equally successful—they fail to command that respect and consideration from literary minds which is their undoubted right, but which they cannot demand under the circumstances.

Men may rise by their own perseverance, energy and talent to an exalted station in life, but it requires the impress of the seal of more mature and masterly minds to place him before his fellow-men as such, and hold him there. No man ever retained his position in society unless he first obtained the approbation of his fellow-men, and to do this, a proper introduction is necessary. No phase of society, no career of man, is beyond the pale of this immutable law of custom and etiquette, and to strive against it is like endeavoring to turn the waters of a stream up hill. We care not how worthy a man may be of honor and fame, he cannot reach the temple without a hand stretched forward to help him.

Before the existence of societies for mutual assistance among their members, every individual who strove for preferment was at the mercy of a few—in many instances inappropriately termed—critics, in whose power lay the fate of all aspirants, and that power was used as often to destroy an opponent as to elevate a friend. Even at the present day, these critics, by means of the press, hold considerable sway over the destiny of men, but it is almost wholly confined to political and literary candidates.

In the world of art, it is different. The valuable societies and academies erected for the encouragement of art have counteracted the effect which personal enmity was wont to produce in the progress of a rising genius, and to graduate with honor from any of them is now sufficient to establish the fame of any man, or woman, and critics are obliged to echo the praise or condemnation of the graduating members, as each society may dictate, or be looked upon as ignorant wherein they wish to appear wise.

This great propensity for depreciating the works of others, exhibited by those who have already attained the upper rounds of the ladder of fame is thus happily hit by one of the poetesses of our country:

"I've gained the pinnacle of fame," he cries,
"Stop, heedless follower if you're truly wise;
Keep from this summit while I stand upon it—
Your'e not a poet till you write—a sonnet."

* * * The conceit of these men is unbounded. What *they* do—what *they* write is sublime—what *others* attempt is ridiculous. Woe to the youth who may stand on the hillside of fame, and look upward with the hope that time, toil, patience, and perseverance may enable him to reach the pinnacle above him. Those who have reached it—often, more by the aid of some friendly hand than from any merit of their own—amuse themselves by perching upon some projecting cliff, and throwing dust in the eyes of the helpless adventurer. If that does not discourage him, sticks and stones follow.

What is now applicable to the literary claimant was often so to the artist, but thanks to the noble institutions for their encouragement, they have no longer the critics revengeful ire to fear.

The Daguerreotypist has not, however, this protective influence, particularly if he be poor, and unable by money bribes to gain the hearts of the caterers for the public eye and ear. In the isolated state in which he now stands something more potent than merit is required to give him that standing in his art which his talents may entitle him to. He must blow his own trumpet—but, mark you by the aid of the press—and that, too, loudly, and he can only make a noise in proportion to the depth of his pockets.

It is true that there are many who have risen to eminence in their art as much on account of their skill as on the loudness of their blasts, but it is equally true, that more who are quite as skillful are yet struggling—almost against hope—in obscurity, merely for the want of the means for touching the hearts of the people through the press.

These are the men who will receive the greatest assistance from Photographic Societies, and yet without any detriment to their already successful brethren. While the former will have better opportunities for becoming known, much greater force will be given to the character of the latter, by the standing they will at once assume before the public.

Leaving out of the question the personal jealousies a society will tend to heal, and looking only to the profits of the pocket, we find ample argument in its favor. The impetus which must naturally be given to the public mind, by the discussions of a society properly constituted, will increase the business four-fold and all will derive more or less benefit from the excitement so created.

There is no doubt that some will be forced to abandon the art, but it will be only those who are its reproach, and whose abandonment will be a blessing, for reasons we have already given in our February number.

We shall pursue this subject hereafter; in the mean time we most sincerely hope that the project will be vigorously pushed forward, and that it will not be long before we can announce the permanent organisation of a National Photographic Society upon equitable basis

IODINE AND ITS COMPOUNDS.

This chemical was first accidentally discovered by De Courtois, a salt manufacturer of Paris, in 1812, and subsequently described by Clement, its precise nature being soon afterwards determined by Sir Humphrey Davie and M. Gay Lussac. It is found in the greatest abundance in the vegetable family algæ, but also exists in mineral and animal matter.

Its equivalent by weight is 124, by volume one measure. Its specific gravity in the solid state is 4.948; in vapor, 8.61; one hundred cubic inches weigh 262.26 grains; it volatilizes at natural temperatures, melts at 227°, and sublimes at 350°.

The best iodine is manufactured in the neighborhood of Glasgow, Scotland, from whence nearly all used by our Daguerreotypists comes.

It is prepared by first extracting all the soluble part of kelp by water, and then heating it to 230°. It is then poured into a stone basin, and sulphuric acid in the proportion of an ounce by weight, diluted with water, to every eight ounces of the fluid is to be added, when a strong effervescence takes place, and sulphur and crystals of sulphur and soda are deposited on cooling.

The effervescence is caused by the escape of carbonic acid, sulphuretted hydrogen and sulphurous acid. The sulphur is formed by the sulphurous acid and sulphuretted hydrogen acting upon and decomposing each other, the hydrogen of the one uniting with the oxygen of the other, forming water, and leaving the sulphur free, which is consequently precipitated; by filtering a clear liquid may be obtained, which contains hydriodic acid. This fluid is then mixed with peroxide of manganese, twelve ounces of the former to 1000 grains of the latter and submitted to a gentle heat in a leaden vessel, when iodine sublimes in the form of greyish black scales with a metallic lustre. The leaden vessel should have a very short head connecting with a large globular glass receiver. In this process a portion of the oxygen in the peroxide of manganese unites with the hydrogen of the hydriodic acid and forms water, the iodine is set free and sublimes into the glass globe, while the sulphuric acid combines with the protoxide of manganese and remains in the retort.

Iodine so obtained is a dark blueish black solid substance with a metallic lustre; when slowly sublimed, its vapor which is of a rich, violet color—from which circumstance it derives its name—condenses into rhomboidal plates or scales. It destroys vegetable colors, turns the skin of a deep yellow, has an acrid taste and pungent odor. It unites with oxygen, hydrogen, nitrogen and the metals.

All iodine is not fit for Daguerreotypists' use. Some of it when not re-sublimed, contains about one-fourth water, has a leaden-grey color and a sensible odor of chlorine. It also frequently contains coal, plumbago, oxide of manganese, crude-antimony and charcoal.

The presence of iodine is easily detected by starch; in fact, so delicate is the test that even if there be but the 1-450,-000 part in a cup of water, a blue mixture of starch and iodine is formed on putting a small piece of the latter into the water. If the iodine, however, be in combination with iodic acid or the *iodates* the starch will not strike a blue color, unless some deoxydising agent, such as sulphurous acid be added; and if it is mixed with any of the *iodides*, sulphuric, or nitric acid must be used to saturation. An excess of either acid or alkali destroy the action of the test. By mixing the liquid containing the iodide with the starch and sulphuric acid, and lightly pouring thereon a small quantity of aqueous chlorine, a very visible blue zone will be developed at the line of contact.—*Balard.*

Solutions containing *iodates* yield, with nitrate of silver, a white precipitate soluble in ammonia; the *iodides* under the same circumstances, give a pale yellowish precipitate with nitrate of silver, scarcely soluble in ammonia, a bright yellow one with acetate of lead, and a scarlet one with the bichloride of mercury. The iodates deflagrate when thrown on burning coals, but the iodides do not. The iodates may also be tested as iodides, by first heating them to redness, by which they lose their oxygen, and are converted into iodides.—*Cooley.*

Iodine and its Action.—I believe that I first discovered a property of iodine which we should least expect it to possess, viz. that of being attracted by the black parts of an engraving, manuscript, &c., leaving the white parts untouched. Thus, an engraving is submitted to the vapor of iodine for about five minutes at a temperature of from 60 degrees to 70 degrees F., fifteen grammes of iodine are required for each square decimeter (a longer exposure is requisite at a lower temperature): this engraving is then laid upon paper "sized" with starch, care being taken to moisten it previously with water acidulated to 1 degree with sulphuric acid. This is the only substance which as yet has been found to give the impression any degree of permanency; however, they ultimately disappear on exposure to the air and light; but by pasting them beneath a plate of glass, they may be preserved for a very long time. The proofs just after having been pressed with a ball of linen exhibit remarkably distinct impressions, which on drying, however, become cloudy. But what is still more remarkable is, that several copies of the same engraving may be taken without subjecting it to the renewed preparatory process, and the last impressions are always the most distinct; for on leaving the engraving exposed for a very considerable time to the vapor of the iodine, the white parts ultimately become impregnant with it, if the paper has been starched; but the dark parts always predominate, however long the exposure may be continued.

The engraving is in no way altered by the process, and it may be copied an indefinite number of times.

I have discovered a means of copying every kind of drawing by the same process, whether made with printer's or common ink (provided gum does not enter into its composition), or with Indian ink or black lead; in short, any kind of linear drawing may be copied, but they must be previously subjected to the following process:—they are first immersed for a few minutes in a weak solution of ammonia, then in water acidulated with sulphuric, nitric, or hydrochloric acid, and allowed to dry; they are then exposed to the vapor of iodine and the process above described repeated. By this method, tracings of designs may be produced which hitherto could not be done in any other way, even when they existed in the substance of the paper. Moreover, when there are two images, one on the face and the other on the back of the same sheet of paper, they can easily be copied separately.

I have pointed out the necessity of the paper which is to receive the impression of an engraving being sized with starch, because the real coloring matter of the copy is the iodide of starch; it afterwards occured to me to coat the surface of the plates of porcelain, opaline glass, alabaster, and ivory, with starch-paste, and then to act upon them in the same manner as I had acted upon the paper: the result as I had anticipated, was incontestibly superior, as compared with the impression upon simple paper sized with starch. When the impression obtained by this process is perfectly dry, it is coated with picture varnish; and when placed under glass, it acquires such stability, that I have preserved some of them for more than eight months without their undergoing any perceptible change.

When I wish to copy an engraving, I prefer using opaline glass, behind which I paste a sheet of paper to render it less transparent; a reversed impression is obtained upon this plate; but in using a plate of common glass which is subsequently reversed, the proof appears non-inverted, and it is only requisite to place a sheet of paper behind it to make the impression more apparent. It may also be kept as a window pane; but in this case the impression must be placed between two plates of glass, so as to preserve it from injury and secure its permanency. The latter application would be very advantageous for the magic lantern.

The impressions may be obtained of various colors, such as blue, violet, and red, according as the starch is more or less boiled; in the former case it inclines to red. A more or less deep bistre color is obtained by exposing the impression to the vapor of ammonia; but it acquires its primitive color when varnished after this operation: consequently an impression thus modified by ammonia cannot be varnished.

I shall now speak of the impressions which may be obtained upon different metals. Thus, by exposing an engraving to the vapor of iodine (for a few minutes only, so as to avoid impregnating the white

parts), subsequently laying it (without wetting it) upon a plate of silver and then placing it in a press, in five or six minutes we have a most faithful copy of the engraving; on subsequently exposing this plate to the vapor of mercury, we obtain an image resembling the Daguerreotype impressions.

Copper is operated upon as we have just stated for silver, and the plate is subsequently exposed to the action of the vapor of solution of ammonia, which is gently heated to produce a more copious disengagement; but care must be taken not to expose the plate of copper until the first vapors have escaped from the box, for this operation requires such an one as is used for mercury. The same plate is subsequently cleaned with water and a little tripoli. After this operation, the image is developed and appears black like the preceding; and moreover, the modification produced by the contact of ammonia extends to such a depth in the plate, that it is not obliterated until the metal itself is sensibly worn.

The latter process will facilitate the labor of tool-engraving.

The copying can also be effected on iron, lead, tin, and brass; but I know no means of fixing the impressions.

I shall only enumerate here from among the many and new experiments which I have made on iodine, those the results of which are certain. Thus I oiled an engraving printed with printer's ink (*encre grasse*), and when dry, exposed it to the vapor of iodine. The impressions were analagous to the preceding, except that they were less distinct. I subsequently made some sketches upon a sheet of white paper (sized with starch) with black crayon, common ink (without gum) and lead; all were copied, and with still greater distinctness when traced on paper prepared for oil-painting. I afterwards took an oil-painting (unvarnished) and copied this also, with the exception of certain colors composed of substances which do not absorb the iodine. The same applies to colored engravings. This will be understood when I state, that an engraving exposed to the vapor of mercury or sulphur no longer takes the iodine; the same occurs when it is immersed in nitrate of mercury diluted with water, nitrate of silver, the sulphates of zinc, copper, &c.; oxide of copper, minium, ultramarine, cinnabar, orpiment, white lead, gelatine, albumen, and gum produce the same effects. However, drawings made with these substances may be copied, by subjecting them with some modifications, to the preparation previously described. I may say that I have not found any drawings which could not be copied, except those made with the iodide of starch.

I shall now speak of a second property which I have discovered in iodine, and which is quite independent of the former; it is that of being attracted by designs in relief, and by all bodies which present ridges, of whatever color or composition. Thus all embossed impressions on white paper are copied perfectly.

The edges of a strip of glass or marble produce also an impression. The same effects occur with elastic fluids, gases or vapors, as the fumes of phosphorus exposed to the air, and the vapor of nitric acid. But iodine also exerts the property of which I spoke at the commencement, as I obtained the following results.

I joined a piece of white wood to a piece of ebony; after having glued them I planed them both, by which means I obtained a perfectly flat black and white block; this was next exposed to the vapor of iodine and then placed upon a plate of copper; the black portion only was copied. I made similar combinations with chalk and a black stone, white and black silk, and always obtained the same results.

All these phenomena are manifested both in the most perfect darkness as also *in vacuo*. I may repeat here, that if the objects are exposed for too long a time to the vapor of the iodine, the white portions ultimately become impregnated, but the black parts are always strikingly distinct upon the plate of metal.

On making the same experiments with chlorine and bromine, the same results were obtained with the former as with iodine; but the impression is so indistinct, that it is requisite to blow upon the metal to perceive it, or rather to expose the plate of copper to the vapor of ammonia, and the plate of silver to the vapor of mercury, to render it distinctly visible

The results with bromine were unsuccessful; all my experiments were made with either plates of silver or copper. There is one experiment which I think worthy of

mention, as being of theoretical interest; it is this: after having put a layer of starch paste upon a Daguerreotype silver plate and upon one of copper, the impression of a drawing which I had thought to copy on the layer of starch became fixed upon the metal without leaving any sensible trace on the layer of starch. It was thus evident that the iodine had passed to the metal, in consequence of a superior affinity to that which it has for the starch.—*Niepce.*

Iodic Acid.—Iodic acid is prepared by pouring 400 grains of muriatic acid on 100 grains of chloride of potassa, in a tubulated retort (the neck of which has a few pieces of chloride of calcium in it,) and is attached to a thin glass receiver, containing forty grains of iodine; by the application of heat, protoxide of chlorine is generated, which passing into the receiver comes in contact with the iodine and gives out both heat and light; the iodine, combining with one portion of its oxygen, forms iodic acid: the rest unites with the chlorine and forms a compound, which is easily separated from the iodic acid by a gentle heat. Iodic acid is a semi-transparent solid substance, having an acid astringent taste, and is decomposed when heated to 390 deg. It reddens and then destroys vegetable blue, is deliquescent and soluble in water. Its salts are termed iodates; they have the property of decomposing water, and detonate with inflammable substances.

Hydriodic Acid.—This acid is obtained in solution by suspending finely powdered iodine in water, and passing through it a current of sulphuretted hydrogen gas; in this instance the hydrogen unites with the iodine, and precipitates the sulphur. The fluid must be filtered, and evaporated by a moderate temperature to the specific quantity of 1.5, and continuing the application of heat, until its boiling point rises to 260 or 262 degrees. It is a transparent colorless liquid, possessing strong acid powers, and effervescing with carbonates. When exposed to air and light it is partially decomposed, hydrogen escapes, and iodine is precipitated, which imparts to the fluid a dark color. Hydriodic acid gas is rapidly absorbed by water, and speedily decomposed by mercury.

Chloride of Iodine.—When dry chlorine is passed over dry iodine at common temperatures, heat is evolved, and a solid chlorine is the result. It is orange yellow when the iodine is fully saturated, and reddish orange when the iodine is in excess. It deliquesces in the air, is volatile, and very soluble in water, forming a colorless fluid which exhibits acid properties. It is the chloriodic acid of Sir Humphrey Davie. This compound enters largely into the daguerreotype manipulation. It most undoubtedly produces the finest pictures of any sensitive used; but, unfortunately, it works too slow for the impatient spirit of man, and its operations are in a majority of cases marred by the tedium produced upon the body by too long sittings. In combination with bromine, however, it works quicker.

Since bromide of lime came into use, bromide of iodine has been almost wholly abandoned, and we think with very bad taste; for, notwithstanding that it is less accelerating, no one will deny that it gave a much more beautiful, bold and finished picture; we think it should always be used now, where the nerve of the sitter will permit.

A TREATISE ON PHOTOGRAPHY;

Containing the latest Discoveries and Improvements appertaining to the Daguerreotype.

BY N. P. LEREBOURS, *Optician to the Observatory, Paris, etc., etc.*

TRANSLATED BY J. EGERTON;

WITH A PREFACE, NOTES AND ALTERATIONS, BY H. H. SNELLING.

PREFACE BY THE EDITOR.

The celebrity to which Messrs. Lerebours and Egerton, both practical Daguerreotypists, have attained in Europe in consequence of their connection with the Photographic Art, has induced us to give their joint work on the subject a place in the columns of our Journal.

We have made such alterations as we have deemed necessary and best adapted to the methods pursued in this country. Still there are many portions of it which might be omitted without any detriment to the work itself, but which are retained on account of valuable notes appended, and which must of necessity produce valuable reflections and ideas in the minds of those who are capable of being more than mechanics in the art.

The experience of such men as Daguerre, Arago, Becquerel, Tony Gaudin, Claudet, Draper, Fizeau, Talbot, Moser, Grove, Karsten, Knorr, and others; all of whom are consulted and referred to throughout the pages of this work, cannot be otherwise than of great importance to every Daguerreotypist, we care not how skillful his practice may be.

Our object in publishing this practical treatise, however, is to meet the request of a large number of artists, who have consulted us on the subject. It will be found to abound in most valuable reflections and suggestions, apart from its practical nature. The hints in regard to the choice of apparatus, plates and cameras, coming as they do from one who is not only a Daguerreotypist but a practical optician, are, in themselves, sufficient inducements for a careful study of the whole work.

PREFACE OF THE TRANSLATOR.

The publication in English of Mr. Lerebours' celebrated Treatise on Photography, has been considered by the Translator, and several highly scientific friends and admirers of the art, as a desideratum which would be very acceptable to the public, and to the scientific world in general. Under this conviction the task was undertaken. This Treatise contains, the most familiar and practical details relative to the approved manner of manipulating throughout the different processes of the art—valuable hints respecting the choice and purchase of the plates, apparatus, &c.—the method of preparing the various chemical substances employed, and minute considerations on every feature connected with the subject: a uniform attention to all which, cannot fail to give the operator successful results. It comprises, moreover, all the recent discoveries and improvements suggested by the researches of the most scientific men, at home and abroad, whose attention has been so ardently devoted to the cultivation and progress of an art which has excited the wonder and admiration of the present generation. These labors have given to the discovery of Mr. Daguerre a degree of perfection, which seems almost incredible, considering its brief existence. In addition to the foregoing will be found an account of the singular phenomena discovered hy Professor Moser, and the various theories propounded thereon, by different philosophers; all of which claim a place in a Treatise of this description, as they afford valuable data, which no doubt will one day serve, when men of science are better agreed as to their origin and nature, to explain the rationale of the various phases of the Daguerreotype process. The Translator has been enabled, through the kindness of Mr. Lerebours, to add to this work the communications just made to the Academy of Sciences in Paris, by Messrs. Choiselet and St. Ratel; also by Messrs. Belfield, Lefevre, and Leon Foucault. The reader will observe, that the new theory pointed out by these gentlemen and the pro-

cesses founded on it, are, in some respects, opposed to the opinion of Mr. Daguerre, and seem to favor the conclusion of those who, in denying the inferences drawn by Moser from the phenomena discovered by him, attribute their existence to the presence of organic matter, which, they allege, covers the surface of all polished bodies. Not having had time to test these new proccess by experiment, the Translator can offer no opinion on the merits or demerits of this innovation; but he remembers seeing, about two years ago, the most beautiful specimens of the Daguerreotype then in existence, produced by Mr. Cornelius, of Philadelphia, whose reputation is not confined to the Western Hemisphere, by a process bearing some analogy to the one proposed.

In addition, will be found Dr. Draper's valuable note on the Tithonotype, which explains how easily beautiful copies of the Daguerrean image may be obtained, equal in every respect to the original, by the Electrotype process.

It is the intention of the Translator to make this a standard work, by publishing, from time to time, subsequent editions, so as to keep pace with the improvements and discoveries which may be made in the art. It is, likewise his intention to commence, forthwith, a course of methodical instruction, practically applied; and, for that purpose, he has made suitable arrangements to receive pupils at the under-mentioned address, where they will have the advantage of the best constructed apparatus and chemicals, as sent direct from Mr. Lerebours' establishment in Paris.

In conclusion, the Translator will only observe, as to the merits of the Translation itself, that he has aimed at making it a faithful reflex of the author's meaning, and has endeavored to render it perspicuous rather than elegant or ornamental.

J. EGERTON.

1, Temple-street, Whitefriars.

INTRODUCTION.

The third edition of this work, of which we published 1,800 copies, having been all sold, we have determined on bringing out a new one. As we could not pass unnoticed the additions and alterations since made in this art, many of which we have ascertained to be useful and valuable improvements, we have written anew all that part which relates to the different operations; and it is by following the directions given in the course of this work for executing these operations, that we have been enabled to produce those beautiful proofs which are daily to be seen in our collection.

We have, therefore, in the first part devoted our attention to describing, in the clearest manner possible, the new processes which have been adopted and practised in our portrait department; and we have added, in the form of notes, some particulars and facts which appeared to us to be worthy of notice.

We feel bound to express our sincere obligation to our friend, Mr. Claudet, for making known to us, without the least reserve, some important improvements, which many others in his situation would have kept secret. Those who have had an opportunity of admiring the numerous superb portraits presented by him to the Institute of France, will doubtless be eager to adopt his discoveries and improvements, described in the course of this work, and particularly those contained in the chapter relating to the polishing of the plates. These processes are the surest and most expeditious, and the operator will obtain, by their adoption, finer and more vigorously-toned impressions, than by any of the methods hitherto known.

Last year, in speaking of the accelerating substances, we represented the bromide of iodine and the bromine-water as being attended with equally advantageous results, but we can now be much more explicit. We can, on this occasion, express ourselves in accordance with the notions contained in a manual on photography, in which every one is not treated with *equal favor*, but which, nevertheless, has in its pages some excellent articles; and we say, in the words of the author :*—" The bro-

*We had at first thought of answering some of the numerous assertions contained in that work, which to say the least, were made upon slight grounds; but, upon reflection, we thought that those epigrammatic inuendoes and insinuations, in which one must necessarily speak of self, are not at all relished by the reader, who requires only to be instructed. Besides, we declare it plainly, that style of writing, *to which we were never the first to*

mine-water is undeniably the most active, the most simple, and the most perfect accelerating agent that has yet been employed in photography."

We do not profess to maintain that perfect results are only to be obtained by the use of the bromine water. Mr. Tony Gaudin has proved that the bromide of iodine, when properly prepared, has equal sensitiveness; but the greatest difficulties must be encountered before the *maximum* of sensitiveness is reached; which, on the contrary, may be obtained immediately and without any trouble, by the use of the bromine water at a proper degree of strength

The flat pans which we recommended last year, with a certain degree of hesitation having been tested by experience, and generally approved and adopted, we have endeavored further to improve them, and think we have succeeded in that object, by simplifying the operation of the dosing, and by making them so as to serve either for plates with frames, or for naked plates.

Our readers will find in the same chapter a description of the *brass* frames, first used by Mr. Claudet, and already adopted by a great number of operators, for carrying about, and preserving, the bromined plates.

The choice of the greater number of amateurs having been directed more to the production of portraits, than to views or landscapes, they, as a matter of course, have sought after the object-glasses which operate with the greatest rapidity. On this subject we can confidently repeat, what we said in our last year's edition; viz., that we have never found any combination for the plates of small dimensions; that is to say, for the plates of the 1-6th size, which operated quicker than the object-glass of our apparatus of the 1-6 size, which we term the portrait apparatus.*

have recourse, is very repugnant to us: as we think there is no compensation in satisfying, for a few short moments, one's self-love, when this paltry satisfaction may tend to impair the sentiments of esteem which honorable men mutually owe one another,

*It is evident that, with the same accelerating substance, the rapidity of the operation can only be increased by shortening the focus of the lens; but, as this shorter focus can only be obtained by having a lens with stronger curves, it follows that a great number of apparatus with one or two object-glasses, and got up with little care and upon no scientific principle, will give images *clouded and indistinct all over the plate and entirely deformed towards the edges.*

When, on the contrary, it is requisite to operate upon the larger-sized plates; viz. for the quarter, half, normal or standard sized plates, and the extra sizes; there is a very great advantage in using the double object-glasses, which can, with the same length of focus, and without giving any visible traces of abberration, admit of a larger opening than a single lens, and consequently more light.

"The object-glass," says M. de Valicour, "is undeniably the most important part of the photographist's apparatus, and *has been justly termed its soul.* It is therefore to the choice of a good object-glass that the amateur should chiefly direct his attention. In vain would he scrupulously adhere to all the other conditions of success, in the various processes employed; he would never obtain a good picture without a perfect lens: but as it is only after long use, and numerous experiments, that the qualities of a good lens can be ascertained, it is important to procure one from an optician, whose reputation and standing oblige him to furnish none but such as are perfect. Many persons have lost their predilection for photographical essays at the very outset, because they had bought haphazard the first Daguerreotype apparatus they met with, and the impressions they obtained were necessarily defective, in consequence of having a defective obect-glass."

This advice is excellent: persons desirous of purchasing an apparatus cannot be too strongly urged to apply to opticians of respectability and talent in their profession and whose name is a guarantee of the goodness of their instruments. We may say of ourselves, that we take great pains to give complete satisfaction in this respect; at the same time, candor requires that we should add, that there are in Paris several houses, besides our own, where the same certainty of being supplied with good instruments will be found to exist.

Our readers will see, in the chapter containing a description of the apparatus, that we have adopted, for all the sizes except the sixth, curved plates, by means of which all traces of abberration are got rid of.†

† We fully expect that it will be said—You only adopt curved plates because you cannot ob-

In respect to the wood-work of the apparatus, we have chosen the walnut-tree wood, as that which combines the most advantages. We do not use any varnish, for obvious reasons; and we have chiefly directed our endeavours to availing ourselves of every improvement hitherto known, preferring to sell a *complete*, and, above all, a *conveniently* arranged apparatus, rather than a showy or cheap one, not heeding whether we thereby enhance the price by a few francs: in a word, rather than diminish the price to the detriment of the quality, we have endeavored to get up every article of our apparatus in as perfect and highly-finished a state as possible. The amateurs of photography are, of course, the only competent judges; and they can compare our articles with those of our competitors, and decide accordingly.

In the second part, we have pointed out the best methods of reproducing views, or landscapes, interiors, living models, portraits, &c. We have omitted nothing that experience has taught us on this subject, which is daily practised in our establishment; and we have thought it our duty to add several useful extracts, which we have taken from the notes of different authors who have written on this art.

We call particular attention to the third part, which, besides other useful matter, contains the excellent notes of Mr. Fizeau on the bromine-water. It comprises all the directions necessary for preparing the various substances and compounds used in photographic experiments. We thought it would be advisable to collect all these notes and present them together to our readers as they were hitherto only to be found scattered in various works which are but little read, and which are, in some instances, difficult to obtain.

In conclusion it appeared to us, that all experiments, having a more or less direct relation to the Daguerreotype, and which are of the highest interest to those who study the physical sciences, ought necessarily to have a place in a treatise like the present, which we were desirous of rendering as complete as possible. We have therefore, inserted, with full details, the preparations of the various kinds of sensitive paper. Lastly, after having made some remarks on the reproduction of impressions by the electrotype, we have mentioned some attempts at engraving photographic impressions, Mr. Moser's experiments, &c. &c.

tain with your object-glasses, on a perfectly flat plate, an image of the same distinctness towards the edges as in the centre. This reproach cannot be seriously maintained, for we defy *any maker* to produce a double object-glass of an opening of 0^{m} 08, without a diaphragm, *and of the usual focus, that is a focus* of 0^{m}. 27, which shall give the image of a *flat object* in a manner perfectly distinct *on all the parts of a plate which has not been curved.* This difference in the distinctness of the image will be but trifling; we are aware of it; and even that it would escape the observation of most persons; but we really see no reason why a maker should scruple to acknowledge that such is the case, and especially why he should refuse to avail himself of means which, without complicating in the least the machinery of the apparatus, gives it a slight additional degree of perfection. This opinion, moreover, is not exclusively our own, and we can support it by unquestionable authority; for at the very time that we thus first expressed our ideas on the subject, we received a visit from Mr. Daguerre, whose opinion we asked, and his answer was, that notwithstanding the slight inconveniences attending the use of curved plates, we ought not to hesitate in adopting them for all the large-sized apparatus with a short focus.

Chapter I.

Description of the apparatus and of the Metallic Plates.

The apparatus of different opticians may be more or less perfect, the object-glass may be single or double, the results obtained more or less satisfactory, they may be moreover, more or less complete; but as all of them contain the several articles which we are going to describe, this description will equally serve for all, of whatever manufacture they may be.

As the first operation for obtaining a good photographic impression consists in the polishing of the plate, the first article to which we must call attention is the board on which the plate is cleaned.*

Fix the clamp on the edge of a table; screw tightly and slide one of the angles of

* We omit the figures and some of the descriptions of apparatus given in this work because they are very unlike those used by the American artist, and in no ways so well adapted to his practice. A complete description of the American apparatus will be found in our " Art of Photography " All improvements in any article of the apparatus therein described will be given, as they are made, in the Journal.—*Ed.*

the plate into a small permanent opening on one corner of the block, the other small opening being moveable and with a slide, serves to receive the opposite angle of the plate; then tighten the screw at this angle, by means of which the plate is kept steady during the cleaning, and let out when that is done.

The substances used with the plate on the polishing-board are the small bags of rouge and tripoli, or the small bottles closed with gauze, as recently proposed by Mr. de Valicourt. Mr. Claudet's velvet buff, with handle, may be used, but only to give the *finishing touch.**

When several plates are prepared at a time, they may be put into the plate-box (which it is unnecessary to describe), after having wiped the edges and back of each plate. But it is better to place them two by two, with the silver sides facing each other, with the frames used by Mr. Claudet between them. When a frame has been thus placed between two plates, they should be wrapped up in tissue paper until they are wanted to be put into the iodine-box.†

The camera is nearly of the same construction in all the apparatus hitherto used.‡

We have adopted the arrangement by Mr. Tony Gaudin, with whom originated the idea of placing the object-glass even with the front of the apparatus. The numerous experiments which we have made enable us to *affirm* that, as compared with a great number of *double object-glasses*, made by the best opticians, for plates of the same dimensions, our object-glass, whilst producing an equal degree of clearness in the impression, will always be found to be superior, in point of rapidity of execution, in the proportion of one-fourth.

We have retained for this apparatus the use of variable diaphragms, and they are the same as those used in microscopes, which our head workman in that department adapted, two years ago, to Mr. Gaudin's apparatus ;§ and we have imitated that instrument in the use of the small curtain, which is the only means that can be employed to uncover the object glass quick enough to reproduce with exactness objects in motion, and to mask the sky in landscapes.

As many persons have found much difficulty in using the naked plates, we have constructed an apparatus adapted for using the plate naked, or with a frame; those which are with a frame are provided with two, by which means two plates can be had ready for use. We consider this addition indispensable, for, as the exposition of the plate to the action of the mercury lasts from a quarter to half-an-hour, the consequence was, when but one was used, that the operator was obliged to remain doing nothing during all that time.|| The sliding frame serves to adjust the focus, whilst at the same time it enables the operator to judge, by the ground-glass of the effect and position of the object to be reproduced.¶ With regard to the focus, it is easy to trace on this sliding frame marks for adjusting it, adapted to different distances, which must

* Fine buckskin buff are preferred by the American operator, and are undoubtedly the best.—*Ed.*

† After having been subjected to the action of the iodine, and to that of the bromine, the plates may be kept in the above manner for several hours.

‡ In December 1839 we made an apparatus which gave us some very fine impressions, 12 inches by 15 (French measure.) In mentioning this result, it is not that we consider it as a difficulty overcome, but only to give a proof that we have been unceasingly and actively engaged in making all possible experiments relative to the progress of the photographic art. With our present apparatus mounted with a double object-glass, we produce on similar plates views in fifteen seconds, and portraits in the shade in one minute.

§ The variable diaphragms accompanying our cameras, are placed at will before the object-glass: by means of a knob, you bring before the glasses the opening which is best adapted to the intensity of the light, and also to the degree of distinctness which the subject requires. Two examples will suffice to make ourselves understood; if you wish to obtain an instantaneous view with the objects in motion, you must make use of the largest opening; for you cannot proceed too quickly to reproduce moving objects. If you wish to reproduce a view with such a degree of distinctness, that the objects situated near the edge of the picture be as clearly marked as those in the centre, use the smaller diaphragms. The portrait of a handsome person should be executed with one of these small openings; for the smaller the opening of the diaphragm, the greater degree of minuteness will there be in the impression. If, on the contrary, you have to take the likeness of a person who has wrinkles, or who is pitted with the small-pox, or one who has unpleasant features, then use the large opening, and you will obtain one of those soft and rather vague likenesses which painters call *"flous."*

||. Two minutes is now all that is required for exposing the plate to mercury.—*Ed.*

¶. This sliding frame is analagous to the inner slide of our camera boxes.—*Ed.*

be done with the greatest exactness.* When the sliding-frame has been brought to one of these divisions, the small screw must be made tight, in order that the focus may not be changed during the operation. This apparatus is contained in two distinct boxes; the advantages of this arrangement which is *more complete than any other*, and which preserves the camera and the mercury-box from all emanation from the accelerating substances, have caused us to adopt it for all our apparatus, *of whatsoever size*, and whether made with one object glass or with two.† One of the boxes is therefore made to contain a large mercury-box with legs sliding in and out, a thermometer and a yellow glass to throw the light of a wax taper on the plate, in order that you may look through the plain glass and observe the progress of the operation; the camera is in the same box and contains the two frames, with shutters back and front, the ground-glass, the box for plates, and two of the Claudet frames to keep the bromined plates apart.

Thus, when the operator wishes to take several photographic images during a whole day's excursion, he has only to take with him a certain number of bromined plates; then fill up the vacant space in the box with the lucifer-box, the bottle of mercury and the spirit-lamp. When it is considered that all these articles are contained in a single box which locks up, and which is of no greater bulk than nine inches square and weighing less than 4½ lbs.—it will be admitted that what is called the daguerrean luggage is reduced to a very small compass. It must, however, be borne in mind, that we are here speaking of an apparatus of the 1-6th size; but, as the same arrangement exists for all the other sizes, with this improvement, even those are very different in point of size and convenience, to what they were formerly. Those who might not have sufficient confidence in the use of the plates bromined in the morning, previous to setting out, (in which they would be, however, under an erroneous impression,)‡ may place *temporarily* in the same box, in which they will find sufficient room, a buffing-board, a small bag of rouge or tripoli, the velvet buff for the last touch, the iodine-box, the broming-pan, the fixing-stand, and the chloride of gold; so that if they take besides in their pockets a bottle of bromine water, and another of hyposulphite of soda, they can go out for the whole day, and take portraits or views which

* When you wish to make use of these adjusting marks or lines, you must not use the rack of the tube, which is only really useful for the intermediate distances; the tube which it moves must therefore be entirely pushed in or drawn out. After having put in the ground-glass frame, you must bring the opening before the object-glass and direct the apparatus towards the landscape. When the image has attained its highest degree of distinctness trace a line on the sliding-board. For all landscapes, bring the drawer to this mark; then draw another line for the distance of two metres about (6 1-2 feet), which is the most proper one for reproducing groups. Lastly, draw a third line for the distance of 1 metre 50 centimetres (about five feet), which is the distance best adapted for taking the portrait. By this means you will never have occasion to seek the focus on the ground-glass which always takes up much time; it will be sufficient to obtain the focus exactly, once for all, for the different distances that we have pointed out above; and for that purpose you may make use of letters with advantage. It will therefore be only necessary to briug at each operation the sliding-frame to the adjusting line, and to place the object or the person at a distance approaching that by which this point has been determined, which is easily done by a tape measure.*

† The difficulty which many persons have experienced in tracing these adjusting lines with precision has induced us to trace them ourselves. Our apparatus will therefore be delivered properly marked for the distances usually required. For the other distances, you must of course use the rack; only as the focal distance varies a little, according to the diameter of the opening in the diaphragm, you must bear in mind that in all double apparatus the adjusting lines for portrait distances are made without diaphragms, and that for the landscape distance is made with the smallest.

* It has happened to many persons, and once to ourselves, to obtain no result with an apparatus throughout a whole day, because it had been shut up in the same box as the accelerating substances, which had saturated all the wood.

‡ If the plates are of good quality, we guarantee, that, when prepared by the iodizing process, and bromined in the morning, they will give, throughout the whole of the day, excellent results; if, notwithstanding this assurance, any doubts should remain, a fact, which we are about to mention, will convince the most incredulous. In a large establishment for portraits, in London, under the direction of Mr. Claudet, from thirty to forty plates are iodized and bromined every morning, as will be seen further on; these plates serve during the whole of the day, and if any remain, they are the first used the next morning; on some of these last, it is true, there does often exist some black specks, but only on a few of the number. On the other hand, Mr. Claudet is of opinion that they had acquired a greater degree of sensitiveness.

they can *finish on the spot*, with the portable apparatus contained in the box, the dimensions of which are given above.

Now that we have described all the articles that are required to be kept separate from the chemicals, we shall give a list of those articles contained in each of the two boxes, which are of similar dimensions, these are:

1st. The camera, with variable diaphragms.

2nd. The mercury box, with the yellow and plain glasses and thermometer.

3rd. The ground-glass and frame.

4th. Two frames with shutters, with or without back-board.

5th. The plate-box.

6th. Instrument on which to polish the plate.

7th. Two Claudet-frames to keep apart the bromined plates.

8th. The brass stand, for fixing the picture without adjusting screw.

9th. Iodine-box.

10th. Bromine-pan, with its ground-glass cover.

11th. Spirit-lamp.—12th Lucifer-box.

13th. Small bag of tripoli.

14th. Half a pint of the bromine-water of the standard strength.

15th. A bottle of saturated bromine-water, divided by lines into 40ths of a half pint.

16th. A large bottle of spirits of wine with ground-glass stopper.

17th. A ditto of tripoli, with ditto.

18th. A " iodine, ditto.

19th. A large bottle of oil, with ground glass stopper.

20th. " " hyposulphite.

21st. Rouge for polishing, in a small phial with ground glass stopper.

22nd. Nitric acid in ditto, ditto.

23rd. A boxwood bottle containing the mercury.

24th. A large wide-mouthed bottle, containing the tripoli, with muslin over the mouth.

25th. A glass bottle containing the rouge for polishing.*

This description will suffice to give an idea of the apparatus of larger dimensions; in the latter, the accessory articles are nearly the same; only the different substances, being in proportionate quantities, the bottles containing them are of necessity larger.

We earnestly recommend those to whom a small additional expense is not an object, to purchase the apparatus as arranged in two distinct boxes. They will be amply repaid for the increased price by the possession of an apparatus more complete, and especially more convenient.

Before concluding this Chapter, we must say a few words on our double object-glasses. The double object-glass, for the quarter and half-sized plates, comprises two object-glasses. The inner diaphragm which is placed behind the second lens is only requisite to obtain views of very great sharpness: for the portrait and most other objects, it would be entirely useless, and would only lengthen the operation.

The construction of the object-glasses for the full sized plates, and for those of 24 centimetres by 32, differs from the above only in the addition of a third spare object-glass, which is used instead of the inner lenses. This third object-glass, having a focus much shorter than the other, is used for portraits, and almost always without diaphragm.

We continue to use, for redressing the image, the parallel glass reflector; we have found by experience that it operates quicker than the rectangular prism, and that it gives as clear an image as the prism, whilst its cost is much less.

MR. CLAUDET'S APPARATUS.

The object Mr. Claudet has had in view in the different combination s of his apparatus, is to adapt it to operate with all sizes of plate and all kinds of object-glasses, whether with long or short focus, simple or combined. This form of apparatus is very convenient for those who wish to take alternately views and portraits on plates of different sizes, which renders it requisite to have lenses of different focus, and giving a more or less extended field of light. To take views or portraits on plates of small dimensions, it is advisable, to use lenses with short focus; hence the necessity of having an object-glass adapted to each dimension of plate. It is therefore evident

* It must be borne in mind by our readers that the apparatus and material here enumerated are designed principally for travelling amateur artists, for the purpose of taking views or portraits in the open air, a system very common in Europe.—*Ed.*

that every amateur, and even every one who practises with the daguerreotype professionally, will after all find it most convenient and economical to possess an apparatus constructed on these principles. But there is another reason which strongly recommends it, and that is, that, every year, lenses upon improved principles are introduced, whereby the old apparatus are in a manner superseded. It becomes necessary, if one wishes to be on a par with other operators, to purchase new instruments; whilst, by Mr. Claudet's system, one can profit by all these improvements as soon as known, without having anything else to do than to procure the new optical improvement, or to have the one in use altered. In a word, for those who wish to follow this art without encumbering themselves with numerous apparatus, it is indispensible to give the preference to the one in question.

What therefore distinguishes this arrangement from those which had been followed previous to its invention is, as we have said, the facility of operating with all sizes of plates and with all kinds of lenses, without change of apparatus.

We shall now proceed to describe the construction of this camera, the frames destined to receive the various sizes of plates, the manner of operating, and the adaptation and changing of the object-glasses.

FIG. I.

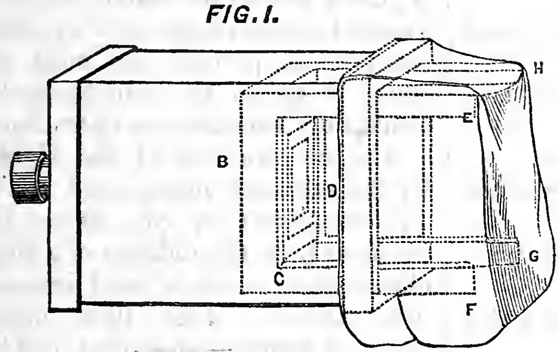


FIG 3.

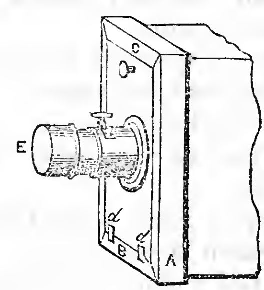
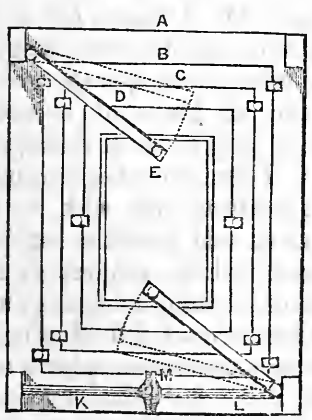


Fig. 1 represents the camera, into which a movable frame, *A B C D*, slides parallel with the sides of the box from one end to the other by means of four ledges, *E F G H*, firmly fixed at each of the four angles of the frame. These ledges suffice to maintain the parallelism when the frame is

FIG 2.



moved to adjust the focus. This sliding-frame includes four other frames, corresponding to the size of each plate, as made so to fit one within the other, and each bearing on the rabbet of the larger one. These frames are shown at fig. 2. When you wish to operate on large plates, take out such of the smaller frames as will leave you the sized frame you require, with its rabbet to receive either the plate or the ground glass. Mr. Claudet operates with naked plates only. He iodizes, bromines, places them in the camera, and conveys them to the mercury-box, without ever fixing them in a frame, as is generally done. He has found that it was more convenient to operate in this manner which is less subject to accidents and dust, both difficult to avoid when placing the plate in a frame and withdrawing it therefrom The moment the plate is polished it is placed over the iodine and then over the accelerating substances. After this operation, Mr. Claudet puts the plate into a flat box with a lid, turning downwards the silver surface of the prepared plate. The plate is supported by slips of glass glued

all round the box; these slips are sufficiently high to hinder the plate from touching the bottom, which is covered with glass. It would be well, before using this box, to be sure that it contains neither dust nor damp. Being entirely lined with glass, it is very easy to dry and wipe it with a linen cloth. The glass slips or ledges, which sustain the plate, are cut off at one angle, to allow of raising the plate easily by pressing it with the finger at its opposite angle.

Mr. Claudet has adopted the use of naked plates for another important reason, and which he considers an essential condition for adjusting the focus; it is that of placing the ground-glass naked (that is to say, without being fixed in a frame) on the rabbet of the frame, which afterwards sustains the plate in the camera. It is evident that, even with the greatest care in getting up the apparatus, when two separate frames are used, one to hold the plate and the other the ground-glass, it but very rarely happens that the plate and the ground-glass occupy the same exact position or distance from the focus of the object-glass. Even admitting that when the apparatus was purchased the two frames presented both surfaces exactly at the same distance, it is to be feared that after the lapse of a certain time, the wood of each frame may have become warped different ways.*

We will now resume the description of the frames of the camera, which we digressed from to explain their use with naked plates. We have said that the frame A, figure 2, is intended for large plates; when it is wished to operate with plates of the half size, the frame B, is placed upon the rabbet of the frame A, it is fixed by means of a spring, and the frame C, is added in like manner for the plates of the quarter size, and the frame D, for the plates of the one-sixth size; if it were wished to operate upon plates of other dimensions, it would only be necessary to adapt other frames of corresponding sizes.

To obtain the proper focus, a ground-glass of the size of the metal plate is put into one of the frames A, B, C, D, and maintained in its place by means of the large spring E, and its corresponding lower one, which turn on a screw, and which are brought upon each end of the ground-glass; then, after having unmasked the object-glass, the frame is moved forward until the image of the object is shown most distinctly on the ground-glass; the stem K. L., is then firmly screwed on by turning the nob M. This operation forces in an outward direction the two bars or ledges F. G (fig 1), and causes them to be pressed with force against the sides of the camera, which perfectly fixes the movable frame in the situation in which you have placed it in respect to the focus.

When this is done the ground-glass is withdrawn, and the prepared metal plate is taken out of its box in the camera, and put in its place. It is advisable to have a black cloth curtain hooked on to the opening of the camera, by which means the operator can take the plate from out of its box and place it in the frame without exposing it to the light. The plate is kept firmly in its frame in the same manner as was done with the ground-glass, by means of the spring E. and its corresponding lower one. When the operation is finished, the two springs are shifted, the plate being meanwhile upheld by the hand, and it is put back into its box to convey it thence to the mercury-bath.

The changing of the object-glasses adapted to each size of plate is performed by means of the board B, fig. 3, on which each lens is fixed, and which is adapted to the front A, of the camera; they are made to enter within two stops, *d*, *d*, and fixed with the screw C. Nothing is more easy than this change of lenses. Thus with a single apparatus it is possible to operate with all sizes of plates, with object glasses adapted to each size. The camera may contain the mercury-box, the iodine-box, the lenses, &c., with another small box containing the chemical preparations distinct; the operator has thus in a convenient shape one single apparatus, by which are performed the operations of four instruments.*

* Mr. Claudet's system appears to us very rational; we cannot but approve of the precautions he has in view; however, for those persons who are accustomed to operate with plates fixed on frames, we can assure them that no frame or other part of our apparatus, leaves our establishment without being thoroughly proved.

* Just as this work was going to the press, Mr. Boquillon communicated to us an improvement which he proposes to introduce to Mr. Claudet's

CHAPTER II.

Comparison between the process formerly in use and the one at present adopted.

It is certain that the application of the sensitive coating, by the use of the bromine water at a given degree of strength, introduced by Mr. Fizeau, is not attended with the uncertainty which occurs in the use of other accelerating substances; and it cannot be denied that the first named preparation is infinitely more simple and easy. Now, that by the use of double object glasses, we are enabled to operate with great rapidity, in case it is only wished to copy an edifice, some operators will confine themselves to Mr. Daguerre's method.* In our opinion the beginner would do well to practise the method pointed out by the master of the art; but in order that the uninitiated may, by a single glance perceive the difference which exists between the two modes of operating, we will here give a succinct analysis of the old method, and then give, in contrast, an abstract of the system at present followed; these methods thus contrasted will give an insight into the working of the Daguerreotype processes to those who are, as yet, unacquainted with the art.

OLD METHOD.

1. Rub the plate with oil, clean off the oil, heat the plate strongly, and polish it well with pounce or tripoli.
2. Apply a coating of iodine (of a golden-yellow color.)
3. Subject the plate to the action of the camera.
4. Subject the plate to the action of the mercurial vapors.
5. Deprive the plate of its sensitive coating in the hyposulphite bath.
6. Wash the plate with distilled water in a boiling state.

NEW METHOD.

1. Clean the plate with alcohol, or nitric acid and rotten-stone, and then polish with rouge.
2. Apply the coating of iodine.
3. Subject the plate to the vapors of the bromine water or other accelerating substances.
4. Expose the plate to the camera.
5. Subject the plate to the action of mercury.
6. Deprive the plate of its sensitive coating in the hyposulphite bath.
7. Fix the image by means of the chloride of gold, according to Mr. Fizeau's process.
8. Wash the plate with filtered or distilled water.

CHAPTER III.

Choice of the Plates.†

If the object-glass be the most essential part of the photographical apparatus, the plates are its most essential accessories. It is well known that the plates coated with silver, as well as all other plated works, must have stamped on them a number showing the quality of the silver and the manufacturer's mark; the law *is positive in this respect*; but what many persons do not know is, that the order of the 19th of Brumaire, of the year VI. of the Republic, is not at all observed in practice. There exists in this matter, what by common consent has been called *toleration;* this toleration, (which was at first granted to the manufacturers, in order to throw no impediment in the way of their trade, by exacting from them the precise quality of the article they produce, which may vary by a small proportion in plated metal,) has been much abused, and—we ask pardon for the expression—the cause of a system of swindling. In this state of things, it was agreed to admit a plate containing 1-35th part of silver for a 30th part, a 25th part for a 20th, (this last case, we must admit was much less frequent;) at present it is no longer even thus; under favor of the tolera-

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apparatus. Its principle consists in substituting for the four ledges, E F G H, a box or case complete, occupying the whole of the interior of the camera, and fixed at the proper point by means of an external screw. This arrangement presents the advantage of enabling the operator to copy, in their natural size, engravings or other objects of small dimensions; as it is sufficient for that purpose to turn round the inner case so as to bring the frames A B C, outside, and by this means to double the distance betwixt the plates and the object-glass; a necessary arrangement for obtaining distinctly the image of objects at the focal distance from the object-glass.

* See the description of the Daguerreotype and Diorama, and the process adapted to each, by Mr. Daguerre: Paris, 1839. Published by Lerebours, optician to the Observatory of Paris, Place du Pont Neuf, No. 13.

* The plates are manufactured in the following manner:—A thin sheet of pure silver is laid on a much thicker sheet of pure copper perfectly flat, and both are enveloped in a sheet of thin copper; the whole is then subjected to a cherry-red heat. The adhesion of the two metals is facilitated by rubbing the the upper surface whilst hot, with an iron roller; they are then immediately passed between two steel rollers turning inversely. This last operation (*the laminage*), reduces to extreme thinness the two metals, which are thus soldered, and brings the metal to the required thickness: nothing then remains but to cut the plates to the proper size and to planish them.

tion we are speaking of, some manufacturers more daring, and less scrupulous, have not hesitated to sell plates containing only 1-90th part of silver, for 1-30th, and even beyond that proportion; and in order to screen their person if not their honesty, from the strong arm of the law, they have omitted to mark the plates with their private mark. It has come to this! The excuse by which such a fradulent practice is sanctioned, is that of maintaining the *interest of the French manufacturer.* It is pretended that, as many governments do not oblige their subjects to mark their plates according to the real quantity of silver they contain, the French cannot stand against the competition, except by pursuing this course. And thus it is, that plated articles marked as if containing 1-10th of silver, contain in reality but 1-60th. The result has been, that the French makers, who might have monopolised the trade in these photographic plates, have already in the English formidable rivals. Is it not grievous to see a new branch of industry thus impeded, and perhaps entirely lost to France, because one or two manufacturers have been too covetous?

But to return to our subject: the plates should only be purchased of a respectable firm. However, we advise those who wish to make use of them to have them tried. This kind of article passing, as it does, necessarily through different hands, too much care cannot be taken in examining it.

To obtain plates which will admit of being repolished a sufficient number of times, even after having been fixed, it is necessary to choose them of a quality not less than that of 1-30th of silver. In the portrait department of our establishment we formerly made use of no plates of a quality inferior to that; but for some time past, in imitation of Mr. Claudet, who has informed me that he only uses in London, plates containing 1-40th of silver, this last proportion is not only used for a great number of portraits executed by us, but also exclusively for all experiments. Beginners, and those who wish to make experiments, will effect a considerable saving by using such plates.

Good plates have a strong metallic lustre; they are without specks, &c., and the slightest trace of copper should cause any plate to be rejected. A slight line, or slight scratches are no obstacle to obtaining a fine impression, provided always those scratches do not reach the copper; and care must be taken when operating for a portrait, to place the head upon the part of the plate which is free from imperfections.

Note.—This chapter is a corroberation of the statement we made in our Article on the Difficulties of the Art published in our first and second numbers.—*Ed.*

CHAPTER IV.

Polishing of the Plates.

It would take a volume to describe all the methods that have been suggested for the polishing of the plates. We shall confine ourselves to the following description, which is an exact summary of our mode of operating. The manipulations which we subject the plate to, differ essentially from those which we gave in our last edition; several of them are the result of our own experience, and some, amongst the most important, have been communicated to us by Mr. Claudet.

The new plates, and those having the impression fixed on them, require a longer process in cleaning than the others. For new plates, it is necessary, in the first place, to efface the traces of the hammer and the dust resulting from the planishing; for plates which have had an impression fixed on them, it is necessary to bare the silver, that is to say, to take off the impression which had been fixed by the chloride of gold. When the plate is placed on the polishing-board, it should be powdered over with very fine emery,* then add some drops of very pure olive oil, then with a pledget of cotton it is rubbed with this paste in a circular direction, during a space of from five to ten minutes, and the same operation is repeated two, three, or four times, or even more, according to the state of the plate. As the emery forms a substance which lodges itself in the smallest cavities of the plate, the attention of the operator must be directed, in all the subsequent processes, to fetch it out of these small cavities, the importance of which will be evident to him, since it is impossible to

* Emery is never used in this country. Where the French use emery we use tripoli, and in the place of tripoli we use rottenstone. Olive oil is also entirely excluded from our operating rooms, and alcohol or nitric acid substituted.—*Ed.*

obtain good impressions if the plate be not perfectly clean and highly polished. After the plate has been well wiped, no traces of the planishing should appear, and its surface should be perfectly even and smooth; when this state is attained, the plate should be rubbed with tripoli, which is softer than emery, and will prepare the plate better to receive the last polishing, which will be accomplished without difficulty, provided the plate has been prepared in the manner described.* This last operation, the final polish, is begun by wiping the sides and back of the plate with perfectly clean cotton, then fix it on the plate-board, previously freed from all grease by washing it with spirits of wine, or by placing it on another polishing board kept entirely for that purpose, which last method is preferable: then powder the plate with tripoli, and dip a knot of cotton very slightly into a mixture composed of spirits of wine and water,† and then rub the plate lengthways‡ until it becomes entirely dry. Repeat a second time the same operation, only using rouge instead of tripoli, when the defects which may yet exist will be rendered apparent by breathing on the plate.§

A great number of persons powder the plate, *very slightly*, with rouge, and, with a fresh piece of cotton perfectly clean, rub it for a few seconds longer, in order to deprive it of any remaining dampness which might exist on the silver after the application of the spirits of wine; others, with the same intention of perfectly baring the silver, confine themselves to rubbing the plate rather briskly with fresh pieces of cotton wool only. This method is not bad, but it requires cotton entirely exempt from grease, which it is difficult to obtain, and for this reason we prefer the first; with either method it is, however, necessary not only to use very fine cotton, but also to take care to pick out of it all the small grains and particles of dirt, which it always contains in greater or lesser quantity; for a single one of these particles would suffice completely to spoil the plate, just at the moment of the polishing being perfected, and would compel the operator to begin his work anew with alcohol and tripoli.

The operator cannot be too particular to use the greatest cleanliness in all these last operations; the plate should be often wiped, and the cotton handled with the greatest care, and in such manner that the fingers never touch that part of it which is afterwards applied to the plate.

The last two operations, which we have just described, give to the plate a tolerably good polish; but it is very inferior to that which is obtained by going through the process hereafter described, which Mr. Claudet has been kind enough to make us acquainted with.

Take a piece of white cotton velvet, previously freed from grease by steeping it for an hour in a new vessel containing boiling water; dry this velvet without touching it with the fingers, then cut it to the necessary size, and fix it with tacks on a wooden holder, after having placed between the velvet and the wood, one or two

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* The reader will see that in this process the plates are not heated; this last process, which wears them considerably, is only necessary in case they are stained with mercury. In regard to the polishing with oil, which a great number of persons now dispense with, we think that it *may be entirely dispensed with in respect to the small plates; and we have substituted for it, without any disadvantageous effects, a similar number of polishings with spirits of wine.* Amongst the most beautiful proofs we have ever seen, are those of a distinguished amateur, Mr. Eynard, who has entirely excluded the use of oil from his preparations.

† In winter, spirits of wine may be used without inconvenience; but, during the extreme heat of summer it evaporates with great rapidity, and sometimes does not even give time to cleanse the surface of the plate from all greasy particles. Water slightly acidulated may be used instead, as Mr. Daguerre has directed; however, as alcohol has constantly given us excellent results, we prefer it. Moreover, Mr. De Nothomb has proved that the addition of a small quantity of caustic potassium to the spirits of wine, gives to the impression a superb tone of color.

‡ That is to say, from left to right, but in a direction parallel to the edges of the plate; bearing in mind, however, that the polishing must always be parallel to the horizontal lines of the image *that is to be produced.*

§ In order to be certain that the essential conditions prescribed have been fulfilled, and that the plate is therefore in a fit state for the iodizing process, it should be tried by breathing on it. The dull vapor from the breath should disappear simultaneously from the whole surface of the plate, and the breath will then render apparent, under the form of whitish lines, the defects caused by the particles of dust, &c., contained in the cotton; a small spot of saliva, or the remains of damp on the plate, would show traces of an opposite kind. The traces of mercurial particles will at first have the same appearance, but soon after they will assume that of a dead white.

layers of cloth to increase the softness. Then powder it over with a very small quantity of rouge, and rub the plate for a few seconds in a circular direction ; and to complete the operation, and give what we call the *finishing touch*, rub the plate lengthways in the direction of the polish you wish to obtain : by this operation the plate acquires a black polish of the greatest possible beauty.*

When the plates are finished in this manner, they may be placed, (if intended for use the same day), immediately over the iodine-box, and that would indeed be the best way. The elevation of temperature produced by this last polish, causes the plate to become iodized much sooner, and its combination with the silver of the plate is thereby rendered more perfect.

When they are to be kept several days, they should be put by in the plate box, or better still, placed two by two, with the Claudet frames between them, and wrapped up with the greatest care.

This is the proper place to mention the last communication made by Mr. Daguerre to the French Institute. He therein points out as will be seen hereafter, certain processes which have the effect of giving to the plate a double degree of sensitiveness. It will be easily imagined that we were eager to try a process which promised such results ; and we were the more ardent on the subject, as the method explained by Mr. Daguerre seemed to us, not only very rational, but likewise to add but little complication to the operation ; unfortunately, notwithstanding our most strenuous attempts at success, experience has proved to us that, at least for the large sized plates, success will be very uncertain ; and we are led to this conclusion by the fact that, if on the one hand, it be incontestible that the boiling water extracts from the silver surface all the impurities which it contains, it seems to us, that the grease on it, if any exists, cannot be dissolved in distilled water, as it would be for example in alcohol, which last would offer the same difficulties of execution, and the use of which, besides, would not be unattended with danger : the first difficulty which presents itself, is the great nicety required in causing the water to run off the plate by the action of the flame of the spirit lamp ; the second difficulty, which will always be an obstacle in almost all places, is that the distilled water procured from different manufacturers of chemicals is not sufficiently pure, and always leaves behind it, as it withdraws from the plate, some minute particles of dust or of organic matter. Notwithstanding, other operators, more persevering than ourselves, may succeed better than we have done ; and we therefore subjoin the process as it was communicated by Mr. Daguerre to the French Institute.

On a new process for polishing plates destined to receive photographic images ; a process by which may be obtained perfectly identical results, as long as the external circumstances remain the same. —(Letters from Mr. Daguerre to Mr. Arago.)

" Since the publication of my process, I have not been able to attend much to it. The investigations into which I have been led, have carried me into a route totally different ; and the experiments which they render necessary, have no other analogy with the preceding ones, than inasmuch as that they are also performed upon a metal plate. However, I have been of late so much struck with the unequal results which are in general obtained in the images, even when the experiments are performed by persons who make a special study and occupation of art, that I resolved to seek a means to remedy this serious inconvenience, which I attribute to two principal causes :—

" The first cause relates to the operation of polishing, which it is physically impossible to accomplish without leaving on the surface of the plate traces of the liquid and of the other substances employed in this operation ; even the cotton which is used, —however clean it may be in appearance, —suffices to leave a film of dirt upon the silver. This first cause constitutes alone, one very great obstacle to the success of this operation ; because it retards the photogenic action, by hindering the iodine from coming into immediate contact with the silver.

" The second consists in the changes of temperature in the atmospheric air, with

* A similar velvet buff may also be advantageously employed for the cleaning with oil ; but you must keep one in reserve very clean, and entirely exempt from dust and greasy particles, for the finishing touch.

which the plate is in contact from the first operation, to that of the mercury. It is well known that as often as bodies, when cold, are exposed to a warmer air, the humidity contained in it is condensed. It is to this effect that we must attribute the difficulty experienced in operating in a moist air, such as the atmosphere is, especially when you come to the operation of the mercury, which requires, to give out a proper vapor, a heat of at least fifty degrees centigrade.

"This vapor, which begins by heating the air contained in the apparatus, produces on the metal a mist which weakens the impression. It is very evident that this moist coating is very injurious; if for example you breath several times on the plate, when it is taken out of the camera, the mercurial vapor will not bring out the image.

"The vapor, which becomes condensed *even at the slightest difference of temperature* between the surface of a body and the surrounding air, contains in suspension a non-volatile substance, which might be called the atmospheric deposit; and, as soon as an equal temperature is established between the air and the surface of that body, the humid vapor which had condensed upon it becomes volatile, and, depositing upon it the sediment which it contained, mixes with the air and becomes again saturated with a new quantity of that impure substance, the deposit above named.

"In order to paralyze as much as possible this effect, the temperature of the plate may be kept higher than that of the air which surrounds it, during each of the operations. But it is not possible to carry this heat to fifty degrees, so that it may be at the same degree as the vapor of the mercury, because, if the plate is exposed to that degree of heat, after it has been subjected to the operation of the light in the camera, the image would be obliterated or spoiled.

"At first, I had attempted to absorb the humidity of the air in the mercury box, by the means usually resorted to for that purpose, such as lime, &c.; but these means proved insufficient, and only complicated the process, without giving any satisfactory results. Another means which has been proposed, consists in vaporizing the mercury in the pneumatic machine; by this process, it is true, the mist on the plate is avoided; but the plate is thereby deprived of the pressure of the air which is indispensable to the formation of the image. Results thus obtained are never free from imperfections.

"The following is the process which I have at last fixed upon, because it is very simple, and obviates the two obstacles to success, which I have pointed out above; that is to say, that it clears as much as possible the silver surface of all impurities or atmospheric deposit, and that it neutralizes the moisture produced by the increased heat in the mercury box. By the first of these two effects it augments the rapidity of the operation; and, by the second, it renders the lights of the picture much whiter (especially after the application of the chloride of gold of Mr. Fizeau); these two effects are always certain. The rapidity attained by this process is to that obtained hitherto, as three to eight; this is the exact proportion between the two methods.

"My process consists in floating the surface of the plate, after having polished it, with very pure water, and then heating it to a high degree with a spirit lamp, and afterwards to pour off this layer of water in such a manner as that its surface, on which the sediment which it has raised floats, shall not touch the plate.

"*Manner of Operating.*—Use a wire frame of the size of the plate, with a handle at one of its angles, and, in the middle of two of its opposite sides, two little catches to hold the plate when in an inclined position. After having placed this frame horizontally, put the plate upon it and cover it with as much water as the surface can contain. The plate is then strongly heated underneath, when very small globules or bubbles will be formed on the surface. By little and little these bubbles become larger and at last disappear; continue to heat the plate underneath until the water boils, and then make the latter run off. The process of drying the plate is performed thus: begin by holding the lamp under the angle of the frame at which the handle is fixed; but, before raising the frame, this angle must be well heated, and then, by raising the plate up a very little by means of the handle, the water begins immediately to run off. The operator must manage that the lamp should follow under the plate the sheet of water in its progress, and to incline the plate but a little at a time, and just enough, so that the water in running off lose none of its thickness; for, if it happened that the water dried up, there would remain some isolated drops which, being unable to run off, would cause spots in drying, since they would leave on the surface the sediment which they contained. After that,

the plate must not be rubbed again, for pure water does not affect its polish.

"This operation must only be performed when about to iodize the plate. While still warm it must be placed immediately in the iodine-box, and without letting it cool, it must be subjected to the vapor uf the accelerating substances. Plates thus prepared may be kept a day or two, (though their sensitiveness diminishes a littie during the time) provided several plates so prepared are placed face to face, at a very small distance from each other and carefully wrapped up to avoid the renewal of the atmospheric air between them."

Although many persons have had a doubt on the subject, it is perfectly true that Mr. Daguerre has discovered the means of producing really instantaneous impressions; that is to say, the horse at full gallop, the bird on the wing, the wave in motion, &c. But, unfortunately, these impressions are faint and clouded; those who know the persevering spirit of Mr. Daguerre will not be surprised that he should have withheld this discovery, though so very extraordinary a one, before having brought it to perfection.*

Mr. Fizeau admitting, as a general principle, that the modification of substances which are impressionable from the agency of light is proportioned to the intensity of the radiations, and to the time during which they are subjected to them, drew from it this conclusion, that if, instead of operating with the camera, with a sensitive coating carefully prepared out of the influence of these radiations, we were to operate with a coating already slightly impressioned, nearly to the degree at which it would become visible when subjected to the action of the mercurial vapor (which effect may be obtained by means of a lamp with a uniform light,) the photographic image will be obtained in less time; and, moreover, the effects of light and shade will not be the same—that is to say, that the relations between the intensities of the different parts of the image will be changed.

The difficulty of causing the sensitive coating to become impressioned by a uniform quantity, is the only difficulty that attends this method.

* As we announced in our February number we have succeeded in constructing a box by which instantaneous images may be obtained, and by an entirely different method from Daguerre's, as may be seen by reference to another part of this number.—*Ed.*

Chapter V.

On the Iodizing of the Plates.

If the plate which is to be iodized has just been rubbed with the velvet buff, of which we have spoken in the chapter on polishing, no dust will remain on it, and a slight puff of the breath will take off the few filaments of cotton which may have remained on its surface. If the operator has no buff at hand, he will draw a tuft of cotton from the bulk, and must pass it very slightly over the whole surface in the direction in which it is polished; this operation will clear the plate of all the fine particles of dust often invisible to the naked eye, and which would not fail to cause the impression to be speckled all over with minute black spots.

The plate being thus brought to the required state of polish, it must be placed over the iodine-box, and after being subjected to its fumes during a few seconds its color should be examined, and if it be perceived that it assumes more color on one part than on another, it should be turned round without fearing in the least the action of the light; and to obviate the effect which would arise from the iodine being accumulated in certain parts of the cotton, it must be more uniformly distributed, or else entirely changed.†

The most convenient method for appreciating correctly the color of the plate, is to reflect upon its surface a piece of white paper; when the plate has attained the most proper tint, the paper examined thus by reflection in the plate must appear of a very dark yellow color,‡ beginning to as-

† To understand this, it will be well to state that French artists put cotton saturated with iodine into their boxes, instead of sprinkling the latter in loosely.—*Ed.*

‡ In like manner as is the case with thin laminæ of air, so all transparent bodies, deposited in excessively thin layers, reflect colors which vary according to the thickness of these strata. We may lay down as a general law to which they conform the following order, which it will be seen has more than one relation to the prismatic colors: a *yellow* straw color, a dark or *orange* yellow, a rose color more or less dark in tint, or *red*, violet, steel *blue*, and *indigo* (these last two are nearly the same); and lastly, *green*. After attaining this last-named color, the plate re-assumes a light yellow tint, and continues to pass successively a second time, with the exception of some alterations, through all the shades above mentioned.

sume, but in a very slight degree, a rosy hue.*

It is true that our large plates, fixed upon their curved plateboards, will acquire a rather darker tint towards their curved edges than on the rest of the surface; but, at the same time, the bromine will fix itself in larger quantities on those same parts; so that the result will be, that the sensitiveness of the plate will, after all, be *very nearly the same* all over the plate; and then this slight difference, moreover, will be very advantageous to the effect of the picture; and every one who is anything of an artist will immediately comprehend our meaning. Experience proves that the impressions iodized to a *rather light yellow gold tint*, and brought by the bromine to *a very light rose-color*, have their white parts very intense, and their deep shades very black. It is also known that if you employ a thicker coating of iodine, and apply upon it a proportionate tint of bromine, so as to obtain a *deep rose* tint, the oppositions will be less marked, and the image have a softer tone. This effect has been obvious to every one who has practised the art. The results, therefore, of the curve given to the plate, are, that the furthest parts, or those nearest the border, are more harmonious, and that all the effect is thereby reserved for the centre; and this is precisely one of the laws followed by all good artists.

CHAPTER VI.

On the Use of the Bromine Water.

We have already said that we do not exclusively confine ourselves to one method of polishing; neither do we to the choice of the accelerating substance However, if our opinion were required, we should say that we prefer the bromine-water, at a proper degree of strength, to any other mixture; this preference is founded on its uniform action, and on the facility with which it *always gives, without any second attempt, the maximum of sensitiveness.* Doubtless the bromide of iodine, and many other compounds, may often produce as fine results; but how many fruitless attempts must not be made before obtaining this grand desideratum of the maximum of sensitiveness! and how much care is not necessary, in order to preserve it for several days, after having succeeded in finding it! *

We have considered it advisable to insert in this edition the excellent notice made by Mr. Fizeau on the use of the bromine-water.*

The reader will find in it some indispensable advice for those who wish completely to understand the photographic phenomena.

The square flat pans, of which we had only proposed the use with a certain degree of hesitation in our last edition, having been generally adopted, we shall not enlarge upon the advantages that attend their use, nor upon their extreme simplicity. We add to each of these pans a varnished frame, by means of which the plate is used.

We recommend the use of the marked bottle containing the saturated bromine-water,† which will be found in each of our apparatus for preparing the standard or normal bromine mixture. They will be found an advantageous substitute for the glass tubes, which are so liable to break, and difficult to use.

Each division marked on these bottles corresponds with *one-fortieth part* of the bottle destined to contain the normal bromine water. It will therefore, suffice to pour into the bottles which are to contain the weaker solution (after having first very nearly filled them with water),‡ the quan-

* We have pointed out this shade because it is that which suits best with the use of the bromine-water. Doubtless a plate which has been iodized to a very light yellow tint, or even to a violet hue, may in some cases, after having been bromined in proportion, give a very fine picture; but we were bound to indicate the most favorable conditions for success.

Mr. Buron is one of the first who have pointed out this tint.

* We must, however, except the Hungarian mixture, of which we shall speak in the Third Part of this work.

† The reader will find, in the Third Part, the composition and use of all the other accelerating substances.

† This solution is prepared by shaking well in a bottle, nearly filled with pure water, so much bromine as that there shall remain, after the whole has been well shaken, an excess of bromine at the bottom of the bottle. — (For more ample details, see Mr. Fizeau's Notes, Chapter XVIII.)

‡ Mr. Fizeau has found that it is indifferent whether you use spring or river water, provided five or six drops of nitric acid are added to it for each quart. (See his Notes, Chapter XVIII.)

tity of the saturated liquid contained between each of the divisions marked on the bottles containing the last-named mixture; and by this simple method, the operator can always have a solution of the normal water, *i. e.* a mixture of the required strength of one-fortieth of the saturated solution.*

The manner of using the bromine water is as follows:—Pour into your bromine box enough of the normal bromine water to cover the bottom to the depth of two or three lines.† The top must then be immediately replaced in order to prevent evaporation; after the interval of a few seconds the plate, ready iodized to a *deep yellow color*,‡ must be placed over the bromine pan and instantly covered over with the glass. The time during which the plate should be exposed to the action of the bromine water must vary according to the distance between it and the bromine water in the pan; but with our different sized pans that duration is comprised between twelve and forty seconds. It will, moreover, be easily understood that five or six experiments suffice, if carefully made, to determine invariably, and once for all, the time necessary for each sized plate; and, as this solution is easily made of exactly the same degree of strength, it should be changed at every successive operation. Great care must be taken that the light do not fall on the plate when withdrawing it from the bromine pan to place it in its frame.|| To avoid this, it is advisable to place the frame on the table near the bromine pan. It is, therefore, impossible to fix exactly the time during which the plate must be exposed to the action of the bromine water; that depends on the quantity poured into the bromine pan. The temperature of the atmosphere has also some additional effect, but it is so slight that it need not be heeded. In general we have found that by covering the bottom of the pan with a little more or less of the prepared bromine water, of the aforesaid proportions of *one-fortieth*, in various degrees of temperature, the following number of seconds were sufficient for the operations, viz.: for plates of the one-sixth size, 10 to 15 seconds; for the quarter size, 15 to 20 seconds; for the half-size, 25 to 35 seconds, and for the full or normal size, 40 to 50 seconds.

It will be easily understood that, with a given quantity of bromine water of the same strength, excepting under the influence of an *excess of temperature* of heat or cold, the results must be *identically the same.*§

CHAPTER VII.

Exposition of the Plate in the Camera.

There are different methods of using the camera to obtain a photographic impression. Thus, for example, by one method, you must, after having chosen the most favorable point of view, by examining the manner in which the image is portrayed on the ground-glass, leave the stand in its place, carry the camera into the dark room in which the broming process is performed, place the plate, now covered with its sensitive coating, with its frame in the camera, which bring back and place on its stand. It is needless to say that the camera must be firmly fixed or screwed to its stand, and

* We have adopted the proportion of *one-fortieth* of bromine water, because, having made use of bromine water at the strength of a thirtieth with our pans, the time of exposition, during the heat of a summer's day, was so short as hardly to give time to count a few seconds. This inconvenience, which, however, is only such on account of the accidents which infallibly result from operating with too much haste, is removed by adopting the use of the bromine water, at the degree of a *fortieth.*

† In order to obtain perfectly identical results, you must pour each time into the pan exactly the same quantity of bromine water; it might, therefore, be poured out into a very wide-mouthed bottle or jar, which will serve for a measure; or, still better—not to incur a double evaporation—introduce into the bottle the thin tapering tube of a strong glass syringe, upon which may be marked lines made to correspond with the quantity the pan will hold; or, best of all, and that is what we do ourselves, make marks on the bottle of normal bromine water, dividing it into equal parts.

‡ If the plate be iodized only to a light yellow, the results might be of a bluish or grey tone.

|| Practice will alone show the modifications to be made in the time during which the plate should be exposed over the pan with the same solution of bromine water. This method, however easy, will always be attended with uncertainty; we therefore earnestly recommend that the solution be changed for each impression, otherwise it would be better to abandon at once the use of the bromine water, and to operate from the color of the sensitive coating, as is done for the bromide of iodine, the Hungarian mixture, &c. (See Chapter XVIII.)

§ In using bromine water shallow boxes or pans are decidedly the best.—*Ed.*

that it is necessary to ascertain, with the greatest exactness, before beginning the operation, either by means of the rack, or by the observance of the adjusting lines on the sliding frame, that the image is perfectly distinct. If you make use of a table, trace lines upon it, which will serve to place the camera exactly on the same spot. The operator must exercise himself in working without the help of the ground-glass, and habit will enable him to discover immediately whatever there may be unsightly in the position of the person or object; in like manner he will learn how to govern his apparatus, so that the head may be represented on any particular part of the plate at will; for that purpose it is only necessary to direct his sight by the two upper projections of the box, and to bring within an equal distance from these projections, the object which is to occupy the middle of the picture. In order to determine the inclination of the camera, you must operate in a manner exactly similar.

Another method which is adopted by many persons is as follows: they begin by placing their apparatus in a proper position, and when they have brought the object to show well on the ground-glass, they withdraw the latter and put in its stead the frame which bears the plate. The slide must be opened with great care, so as not to put in motion, by a jerk or a strong current of air, the dust contained in the camera;* after that uncover the object-glass till the required time has elapsed for producing the impression. It is at this juncture that a real difficulty exists for beginners; as nothing is visible, it is impossible for them to determine with exactness the time that the plate should remain in the camera, but with a little practice they will be able to appreciate it correctly. It will be remembered that the time during which the plate must remain in the camera, mainly depends on the intensity of light acting upon the object to be reproduced; thus, in the south of France, in Italy, or in Egypt, the operation can be performed, all other circumstances being the same, much more rapidly than in the north; you must also take into account, with the same apparatus and the same sized opening of diaphragm, the color of the object to be reproduced,* and the *color* and *intensity* of the solar light.† If the apparatus and the diaphragms are dissimilar, you must add to the causes of uncertainty alluded to, the difference resulting from the disproportion of focal length and the openings of the diaphragms.‡ All this seems, at first sight, very embarrassing, but in reality the difficulty can be overcome by making a few experiments, and becoming acquainted with the working and powers of the apparatus used; and when once an operator has acquired a little experience and a perfect knowledge of the apparatus in continual use, he will almost always succeed in judging at once

* To avoid these particles of dust, which produce a quantity of black specks on the image, you must take care to well wipe the inside of the camera as well as all the grooves and ledges. If, intending to take a view or landscape, you carried out with you several prepared plates in their frames, you must wrap them up in a cloth containing in its texture no particles of dust, such, for example, as an oil-skin, and by following the directions that we have given above for opening and shutting the slide, you will avoid those little spots which are sufficient to deprive a good impression of all its value.

* All colors are not equally photogenic: thus, the chrome yellow, the P. Veronese green, and vermillion, three of the most brilliant colors of the painter's pallet, have hardly any action upon the sensitive plate; the blues, violets, and lakes, have, on the contrary, a very energetic one. We have made on this subject, a great number of experiments, which we shall probably publish later.

† The photogenic intensity decreases in a very considerable degree in proportion as the sun approaches the horizon. Thus, on a fine summer's day, with a cloudless sky, at noon, a fraction of a second will only be necessary with our one-sixth size apparatus and single object-glass, to produce a picture; whilst at six o'clock in the evening it would take three or four seconds, and at seven, when objects are still glowing in the warm light of the setting sun, it will take not less than from fifteen to twenty seconds.

‡ And even then we do not take into account the greater or less degree of the sensitiveness of the plate, which, however, will vary but very little if the method pointed out by Mr. Fizeau be strictly followed.

of the time during which the plate should remain in the camera.

We give in the following table some *indications* on the duration of the exposition with different apparatus :—

STATE OF THE ATMOSPHERE.	DURATION OF THE EXPOSITION. With Plates, 1-6th.	With Plates, 1-4th.	With Plates. 1-half.	With whole or Normal Plates.	With Plates, om.24, by om. 32.
	Seconds.	Seconds.	Seconds.	Seconds.	Minutes.
With a sky veiled by slight white clouds. The apparatus turned towards the north	2 to 4	10 to 15	15 to 20	20 to 50	1-2 to 2
With a sky veiled by slight white clouds. Towards the south	1 to 2	5 to 10	10 to 15	15 to 30	20 to 60
On an open terrace	1 to 2	5 to 12	10 to 20	20 to 40	h. 1 to 1 1-2 h.
With the object illumined by the sun	a fraction of a second.	1 to 4	3 to 6	6 to 10	s. 15 to 20 s.

In the event of a first attempt failing, the operator should make another immediately, and he may be almost certain of succeeding in this second trial. The following are some indications by which the operator will know whether he has left the plate in the camera too long or too short a time. The exposition will have lasted too long, and the impression will be completely *burnt* or *solarised*, when all the objects reproduced are apparent, but with an inverse intensity to that which they had in nature; that is to say, that the whites have become blueish, and those parts which should be black are more or less approaching to white. It will be known when the plate has not remained sufficiently long, when those objects *only* which have received most light are reproduced *very distinctly*, and when the other objects appear indistinctly traced, and too dark, or else not at all apparent. This differs, as the reader will see, from what has been published and repeated several times, and which is to this effect: "If the plate has not been subjected long enough to the action of light, the impression will be vague, and its outlines faintly marked, the details indistinct, *and the image, as it were, covered with a veil.*"

When you have shut out the light, take the same care in withdrawing the plate from the camera as was formerly recommended for placing it there, and convey it thence to the mercury-box.

CHAPTER VIII.

*Exposition to the Mercury.**

The mercury-box should be kept, if possible, in a perfectly dark room; and in any case, the front of the box, in which is inserted the piece of plain glass, must be kept in an opposite direction to the light.

The plate having been put into the box, the mercury must be heated with the spirit-lamp until the thermometer rises to

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* Mercury is found in a natural state as a liquid in a red stone called cinnabar; it is known by the name of quicksilver: quick, because if thrown on the ground, it becomes separated into small particles, which run about every way; and silver, on account of its resemblance to that metal in color. It acts upon gold and silver; it must not, therefore be touched with rings, or any other articles made of those metals. If by accident a ring were stained with mercury, it should be heated, and the mercury would go off in vapor. If the ring were even completely destroyed, the mercury should be taken care of, as it is possible to separate from it the precious metal, which still exists in the mercury, and has only lost its form.

about 45 degrees centigrade;* the lamp is then withdrawn, and the thermometer will continue to rise about 55 or 60 degrees.

When the mercurial vapors have produced their effect upon the image, which takes place in about ten minutes,† heat a second time in the same manner; and according to the appearance it has, this operation may be repeated three or four times; the impression will improve a great deal by being subjected a considerable time to the action of the mercury. However, as soon as you perceive that the darker parts assume an ashy hue, no time must be lost in withdrawing the plate ‡

CHAPTER IX.

On the Hyposulphite Wash.‖

In the greater number of pamphlets hitherto published on this subject, the proportion of hyposulphite recommended as necessary was much less than that really required. Many operators have applied to us to know what could be the cause of those numerous bluish and milky spots which appeared when the plate was fixed by the chloride of gold. It is our opinion that it is unnecessary to decide upon a fixed proportion, and that there may be an excess of hyposulphite without any bad effect; but, as we have said before, if the solution were too weak, an injurious effect might be apprehended. The following is the method which we have decided upon as best:—

We put into a bottle, which will contain a quart of distilled water, a glass funnel lined with filtering paper; herein we put 100 grammes of crystalized hyposulphite, and we pour upon it a certain quantity of water from another bottle, which we renew each time that the funnel is empty. When the bottle is filled it seldom happens that there remains any crystalization, and the solution which it contains is in the proper degree of saturation and ready filtered.

We must first explain the method of subjecting the larger plates to the hyposulphite wash. If it is intended to fix them by the chloride of gold immediately after, no better process can be followed than that pointed out by Mr. Fizeau. (See Chapter X.)

If it is only required to deprive the plate of its sensitive coating, it must be plunged in a flat vessel containing filtered water, and must be withdrawn from thence by taking hold of it by its edges and carrying it horizontally to plunge it into the second basin, which must contain the depth of one centimetre of the solution of hyposulphite, prepared according to our previous direction; immediately after the immersion, the solution must be shaken, and the coating of iodine should entirely disappear in a few seconds. It is again immersed in the first receptacle, which is shaken in order to wash off the small crystals of hyposulphite; then withdrawn, and still holding it with both hands by the edges, it must be placed on the drying-frame, and boiling distilled water poured upon it, or in lieu of

† We have recommended the use of the thermometer only for beginners. A little experience will easily enable the operator to appreciate the proper degree of heat. He should apply his hand under the mercury-cup as soon as the lamp is withdrawn. If there is but a gentle heat, he must apply the lamp again for a few seconds. The most proper degree of heat, in our opinion, is that at which the hand feels the cup sufficiently hot to be unpleasant to the touch if kept in contact with it, but yet not so as to burn it. Several persons are in the habit of heating the mercury before placing the plate in the box; this method is not a bad one, but we have found no particular advantage in its use.

† Generally speaking two minutes are sufficient.—*Ed.*

‡ The exposition of the plate to the mercurial vapors is only a question of time, for if you leave during an hour or more, in the mercury-box, plates for which it would have been necessary to apply heat several times, the result would be just as good. Mr. Claudet has, besides, proved that, in the pneumatic machine, at a temperature of 10 degrees centigrade, a plate is perfectly mercurialised in a quarter of an hour*

* Different preparations have been pointed out as substitutes for mercury, which is difficult to carry about, and the contact of which is so injurious to the silvered plates.

Mr. de Brebisson proposes to confine the mercury in a linen bag of close texture, which is placed in the cup, and then apply heat in the ordinary way.

Mr. Charbonnier wanted to substitute for the mercury the ammoniacal nitrate of mercury.

Mr. de Nothomb, whom we have already had occasion to mention several times, has obtained, to our knowledge, some very fine impressions with calomel, which is a protochloride of mercury. He made known that process to the Institute in 1842.

Mr. Soleil and others have employed various fusible alloys; but all these methods are now abandoned by the greater number of operators.

‖ The *Hyposulphite of Soda* is a beautiful salt, as clear as crystal, which has the property of dissolving the iodide of silver produced by the action of the iodine on the daguerrean plate. It is prepared by the manufacturers of chemicals.

that, if there is no hurry, simply cold distilled water; it is now left to dry of itself, by placing it almost upright on one of its angles in a place where it will be perfectly free from dust.

The washing of plates of small dimensions is much more simple. It is done thus: pour into a flat-bottomed plate half a tumbler of the hyposulphite solution; bring the liquid to one side, by tilting the plate with one hand,—at this moment, with the other hand put in the proof; then depress the plate to its level, so that the liquid, in returning, may cover rapidly and entirely the surface of the impressioned plate. Agitate the hyposulphite solution, by moving the plate gently during a few seconds, and when the coating of iodide of silver is washed off, take the plate out by one of its lower angles, and pour upon it filtered water; then, by placing it over the spirit-lamp, you dry one of the upper corners; after this, take the corner so dried between your finger and thumb, and pour again water upon it, taking care that the water does not wet the fingers, and hold the lamp under different parts of the plate successively in circular movements, and at the same time accelerate the evaporation by blowing on the plate, which is thus expeditiously dried.*

If it is intended to fix the proof immediately, it will be sufficient on withdrawing it from the hyposulphite solution, to sluice it abundantly with water, and place it on the fixing-stand.

CHAPTER X.

Fixing by the Chloride of Gold.

Of all the discoveries and improvements which have been made since Mr. Daguerre's invention, the most important is the application of the chloride of gold, for which we are indebted to Mr. Fizeau. But to return to our small plate. We have explained in the preceding chapter, that after taking the plate out of the hyposulphite solution, it was to be plentifully washed in filtered water; it is then placed, whilst still wet, on the fixing-stand, previously adjusted to a perfect level, and then, as much of the solution of the chloride of gold as the plate can contain, is poured upon it.

The spirit-lamp is then held under *all the parts of the plate* successively; the image begins first to assume a dark appearance, and then one or two minutes after, it acquires a great degree of intensity; this last effect is always accompanied by the appearance of little bubbles; you then take away the lamp,* wash the plate copiously with water, and dry it in the manner we pointed out in the last chapter. If you operate upon the larger plates, it will be best to follow to the letter the description of the process, as given by Mr. Fizeau, which we here transcribe.

Since the publication of the photogenic processes, every one, and Mr. Daguerre among the first, acknowledged that something yet remained to be done, to give to these marvellous images that degree of perfection, which it is now possible to obtain: I mean the fixing of the impressions, and the giving to the light parts of the image more intensity.

"The process which I now submit to the Academy, appears to me to resolve, in a great measure, this double problem; it consists in subjecting the plate to the action of a salt of gold, prepared in the following manner:

"Dissolve 1 gramme of chloride of gold in one pint of pure water, and three grammes of hyposulphite of soda in another pint of water,† then pour the solution of gold into that of soda, by little and little, and shaking it all the while the mixture which is at first of a slightly yellow co-

* To avoid burning the fingers, the plate may be held with a small pair of flat pliers; or else, if for a large plate, they may place it on a frame introduced by Mr. de Brebisson.

* It is advisable to make use of a lamp of a sufficiently strong flame to produce the effect in a few minutes. If after a first heating you find that the impression can admit of a greater degree of intensity, it might be heated anew; but that is seldom necessary, and often by trying to do too well, the operator, if he persists in heating certain parts of the plate may find the liquid dry up just above the flame, and inevitably cause a stain, or else the blacks are covered with a film, or even the coating of silver may suddenly exfoliate, when small particles are detached from it; the impression is then entirely spoilt; but the plate may be repolished.

† The above proportions are calculated for these substances in a very pure state; Mr. Fizeau has given the following ones which will be found generally exact for the quality of these substances as usually sold: one part of chloride of gold to eight hundred parts of water, and four parts of hyposulphite of soda to two hundred parts of water.

lor, soon becomes perfectly limpid. It would then appear to contain a double hyposulphite of soda and of gold, with the addition of marine salt, which appears to perform no active part in the operation.

"In order that this salt of gold process may produce its effect upon the silver coating of the plate, it is important that the latter should be perfectly free from foreign matter, and especially from all greasy particles; it is therefore necessary that it should have been previously washed with great care, which may be dispensed with when you only wish to have recourse to the ordinary wash.

"The following method is the one most generally attended with success:—Whilst the plate is yet covered with the coating of iodine, but exempt from all dust and grease, both on the two surfaces and at the edges, pour a few drops of alcohol upon the iodized surface.

"When the alcohol has wetted the whole surface, immerse the plate first in the filtered water, and afterwards in the hyposulphite solution. This last must be renewed for each plate, and should contain about one part of salt of gold to fifteen of water; the remaining part of this washing process is performed in the ordinary way, only care should be taken that the water used should be as much as possible free from dust.

"The alcohol is used simply to cause the water to adhere perfectly to the whole of the surface of the plate, and to hinder it from running off to the sides on each immersion, which would infallibly cause spots.

"When a plate has been washed with these precautions, even if the image were very old, the application of the salt of gold would be the most simple possible: you have only to place the plate upon the wire frame, which is to be found in each apparatus, to pour upon it a coating of the salt of gold sufficient to cover it entirely, and to heat it underneath with a strong flame; the impression will be found to become distinct, and to assume, in a minute or two, a fine vigorous tone and color. When the effect is produced, the liquid must be poured off, and the plate washed and dried.

"In the operation which we have just described, the following phenomena have taken place:—silver has been dissolved, and gold has been precipitated upon the silver, and also upon the mercury; but with very different results. The silver, which by its polish, forms the dark parts of the picture, is in some degree browned by the thin coating of gold which covers it, whence results an increased intensity in the black parts; the mercury, on the contrary, which under the form of infinitely small globules, forms the whites, increases in strength and brilliancy, by its amalgamation with the gold, whence result a greater degree of fixity, and a remarkable augmentation in the light parts of the image."

RECAPITULATION OF THE FIRST PART.

The operator will take care to buy none but plates of a good quality; that is, such as contain at least a proportion of one-thirtieth part of silver. They must be polished with the greatest care in the manner we have stated; and it must be borne in mind that it is better to polish the plate over again, than to operate with one improperly prepared: before placing the plate over the iodine, care must be taken to clear it of any dust which might adhere to its surface, and the remaining part of the operation must be performed with particular attention, often examining the color of the plate and altering its position, in order to obtain the uniform tint required and to watch the instant it assumes a golden yellow hue. If it shows greenish and darkened tints, it must be immediately set aside to be polished anew; for those appearances would prove that the plate had been spoilt by the mercury, or else that some traces of a former impression had not been erased, or that some remains of a former fixing process were still on it.

If a few seconds were to elapse before placing the iodized plate over the pan containing the bromine water, and the plate had contracted some particles of dust it would be necessary, to whisk them very slightly off its surface with extreme precaution, by means of a tuft of cotton-wool drawn from the bundle; for each of these particles of dust, being saturated with iodine, continues to act upon the plate, all around it, to an extent in proportion to its size, and consequently annuls throughout that space the action of the accelerating substance.

If bromine water is used, it will be ne-

cessary to conform to the previous directions; for if the operator were to confine himself merely to diluting it with water, and depending on the color for the result; or, if he should make the same solution serve several times, or, again, if he were to pour into the bromine pan an uncertain quantity of bromine water—in either of these cases, he would be far from obtaining identical results, and would do much better to be guided by the color of the sensitive coating, by bringing it to the rose tint, either with the bromide of iodine, the Hungarian mixture, or the bromine-water.

Great care must be taken that, in conveying the plate from over the accelerating mixture to the camera, no ray of light should reach it.

We cannot establish any rule for the duration of the exposition in the camera; but if the operator examines carefully the effect of the circumstances which modify this operation, a very few experiments will suffice to enable him to acquire the necessary dexterity. Adjust the focus with great care; and if you make use of the adjusting lines, pay particular attention to bring the sliding frame to the mark which corresponds with the distance of the object. It must not be omitted, when the object to be produced is very unequally acted on by the light, to screen either with the cloth curtain, or with a piece of black stuff, its most luminous part. In withdrawing the plate from the camera, the same precautions must be adopted, to preserve it from dust and the action of light, as were taken in putting it in.

The exposition to the mercury should last about two minutes, and sometimes more; however, in any case the plate must be withdrawn as soon as it is perceived that the dark parts begin to assume an ashy hue; in general we advise heating the mercury a little at a time, but frequently. At first it will be good to consult the thermometer; but when once the operator has learnt to appreciate the proper degree of heat, by applying his fingers to the bottom of the cup containing the mercury, it will be better for him to dispense with it. He will take care lest any light should fall on the image, before it has been sufficiently acted upon by the mercury; for that purpose he will not raise the black curtain, which covers the white glass aparture, until after the lapse of several minutes, and when he supposes that the image is already formed.

The washing and fixing by the chloride of gold process will be accomplished by omitting nothing that we have pointed out in the ninth and tenth chapters. The last wash, that which follows the fixing of the impression, may be performed simply with filtered water; but for the large plates it is advisable to follow exactly Mr. Fizeau's process.

The framing of the plate has also a certain degree of importance, by its effect on the picture; in general, white skeleton frames have been in use: we think, that though they are tasteful enough when well executed, they are particularly injurious to the *effect* of the photographic image; for the scale of tints of all these images is extremely circumscribed; it varies from black to a white hue, partaking more or less of a greyish tint. Must not the contrast with the dazzling whiteness of the border of the frame be most injurious to that effect? Frames covered with a darkish-colored velvet, those which are gilt, and the skeleton frames, with a rather dark border, will do infinitely better.

END OF THE FIRST PART.

GABRIEL HARRISON AND THE DAGUERREAN ART.

BY S. J. BURR.

Gabriel Harrison! How the heart leaps within the bosom at the mere mention of the name! And yet Gabriel Harrison is neither a soldier nor a statesman. Though but a young man unscarred by the warrior's sword, he is a hero—to all intents and purposes, an American hero. His courage has been tried in the furnace of affliction; and under circumstances which would have appalled most men, he has (when unable any longer to contend for his own schemes) compelled others triumphantly to carry out his heroic enterprise. But we will not run so far in advance of our history. Let us begin when he began his toilsome and energetic career.

Gabriel Harrison was born in Philadelphia on the 25th of March 1817. His father moved to New York in July 1822; and when only eleven years of age, the young Gabriel was placed at the press, to assist his father in printing bank notes. When thirteen, his father lived in Reade street, and an event which occurred at this time roused his young mind to the importance of acquiring knowledge; for previously his education had been entirely neglected.

A few doors above the house occupied by his father, there lived a small, silver headed old gentleman, who sat much at the front window with his head resting upon his hand, and his eyes most generally cast inward upon the room.

The old gentleman attracted the attention of the kind-hearted, though untutored boy, and his young eyes often discovered tears trickling down the pale and wrinkled cheek. Gabriel longed to know the cause of this silent grief, and yet shrunk from making any approach that would enable him to satisfy his mind On one occasion however, he was so much overcome by this daily occurrence, that climbing up the cellar door, he gently touched the old man's shoulder, and, with a voice of childish sympathy, asked him, "what is the matter? Can I do anything for you?" The grief-stricken man suddenly started—appeared somewhat confused—hastily wiped the glistening drops from his pallid cheek, and replied, "No," but the next moment invited the boy to come into his house.

As he entered the parlor, the first question that met his ear was "do you know how to read?" and as the inquiry was put, a volume of the History of the United States was placed in his hand, from which the boy of thirteen received from his aged friend, *his first lesson in reading*. The character of teacher and pupil was at once established, and Gabriel went every afternoon to rehearse to his new and, as yet, unknown master.

This intimacy was continued for over three months, during which time the old gentleman was rapidly developing the yearning and comprehensive intellect of the boy. He not only gave him his regular reading lessons, but inculcated the purest moral principles, striving to fix his youthful ardor upon a foundation which should be productive of the most good in after life.

He was told that "next to his mother he must love his country best—that he must always be careful to keep the wings of his ambition well clipped—that too much ambition was the bane of many worthy and excellent men. Ambition sometime cut off men in the glory of their manhood's pride; while with others it produced bitter and dreamy thoughts in after life." So delighted was young Gabriel with his kind and instructive friend, that he made rapid progress under his tuition; though he had not yet learned his name. An accident however, soon discovered the standing and character of his benefactor, and at the same time parted them forever. In opening the book one day to read as usual, Gabriel happened to commence a poem headed "Hamilton and Burr." As he pronounced their names, the old gentleman turned quickly toward him—placed his thin hand over the page, saying, "Stop, my boy, not that. Look for something else." The intimation thus given produced a flash of intelligence upon the mind of the lad, who thoughtlessly and eagerly inquired. "Are you the man who shot Hamilton?" "I am that wretched man," replied Colonel Burr, for his aged and grief

worn friend was none other than that distinguished and unfortunate man. The Colonel covered his face with his hands, burst into tears and walked the room rapidly for some moments, when he told Gabriel to go home. He never entered the house of Colonel Burr from that day, though he continually declares that the Colonel was the best friend of his boyhood.

The insight which the boy had obtained of his own soul continued to expand. The fire of mind had been lighted by his unhappy friend, and he determined to procure an education at all hazards. He continued privately his reading lessons, and endeavored to imitate the touching and precise elocution of his teacher.

Shortly after this the young student witnessed a theatrical exhibition for the first time. Of course he was greatly delighted and at once longed to be a stage hero. With this intent he joined a dramatic association, of which he became a very conspicuous member before he was 15 years of age.

In 1838, when about twenty years old, he was induced by a prominent officer of the Texan army to make his first public appearance. This he did in November of that year, at the National Theatre, then under the management of Mr. Wallack. Here he performed the character of Othello, to a splendid house, and was called out to be bravely cheered at the end of the performance. The papers of the day following pronounced the *debut* the best ever witnessed in New York. This announcement attracted the attention of Mrs. George Jones, who immediately called upon the youthful debutant, and induced him to accept an engagement for the Avon theatre, then being built by her husband at Norfolk, Virginia. Under this encouragement, he went to Norfolk; but a few days after his arrival, the new theatre was sold for a church, when he returned heartily disappointed, but with his mind made up never to become an actor.

Mr. Harrison's father was a great connoissur of pictures—delighting in the possession of works by the best painters. Gabriel's home was therefore well stocked with studies, some of which were indeed worthy of being numbered with the productions of the most accomplished artists. Old Mr. Harrison was a gentleman of great enthusiasm and kept the specimens in his gallery as charming and delightful pets—regaling himself for hours in pondering upon their accuracy and admiring their beauties.

On his return from Norfolk, Gabriel's mind seems to have suddenly taken a new turn, or perhaps it would be more proper to say, that the early associations of his boyhood now began to burst forth. Painting attracted his attention, and he made his first attempt at oil-painting; and although possessed of an indifferent supply of materials, he produced a very excellent moonlight scene. Mr. Peter Grain, one of the best scene painters, induced the young artist to take his picture to the National Academy, which was then soon to open for exhibition. Here it was received and well spoken of by the celebrated Colonel Trumbull. Gabriel was strongly encouraged by the Colonel to persevere in his new line, and the treatment which he here received contributed largely to excite his ambition, and engender the highest feelings of admiration for the art. His warmest desires now, were to become a finished and accomplished artist, but such was his position that he could not at that time procure the necessary leisure to forward his design, being compelled to labor at the printing press in order to assist his father, who had encountered some reverses of fortune. As his labors contributed to the support of a beloved mother, and a large family of sisters, they were cheerfully given, and his favorite study for a while abandoned.

But the inborn desire only slept to be awakened to higher pursuits and more daring enterprise. In 1842, observing that nothing but a disordered and unseemly heap of bricks marked the spot in Trinity church yard, where rested the remains of the gallant Commodore Lawrence, his soul was humiliated by the neglect of the hero's grave. Burning with ardent patriotism he resolved, that a monument of native marble should adorn the spot; and if the wealthy corporation or the nation could not be induced to rear some mark of remembrance he would do so himself.

This was a gigantic enterprise for a young man of only five and twenty. His plan to accomplish his purpose, may be judged by the follwing extract from the Commercial Advertiser of that year.

"Doings among the City Fathers.—Both Boards met last evening at the usual hour.

In the Board of Aldermen a communication was read from Gabriel Harrison, who sets forth that he is a native American—his soul fired with patriotism, and his cheek mantled with a tinging blush at the neglect of the remains of the immortal Lawrence, now lying entombed in the rear of Trinity Church. He farther sets forth that he is an amateur artist, and intends to execute some designs he has formed to illustrate the battles of Lawrence. These pictures he will exhibit throughout the country, and with the proceeds of such exhibition will erect a splendid monument over the remains of the hero. The monument will be completed within three years.

The object of the communication to the board was to give "publicity" to his patriotic enterprise.

Ald. Crolius said if there were a committee on patriotism, he would move to refer the paper to that committee, but as there was not, he moved a reference to the committee on arts and sciences, and it was so referred."

Surrounded by uncommon difficulties he still continued at his pictures, and in two years had the satisfaction of seeing them completed. He now had them handsomely framed, at a cost of one hundred dollars; and, somewhat altering the detail of his plan, took them to Albany with the following prospectus, for the purpose of inducing Governor Bouck to head his committee.

A MONUMENT

TO CAPTAIN JAMES LAWRENCE.

"The Undersigned would respectfully beg leave to call the attention of his fellow citizens to the enterprise which he has undertaken —an enterprise which has been suggested by the purest patriotism, and an abiding desire to see justice done to the memories of the brave men who gave their talents and their lives to their country's service.

"Captain James Lawrence, that gallant man, whose last words, 'Don't give up the Ship,' have become the war cry of our Navy, —lies unhonored and forgotten in an obscure corner of Trinity Church Yard. The shabby and *economical monument* which was erected to mark the spot, and to perpetuate for a day the memory of the brave sailor, has fallen before the storms of twenty years and its ruins now lie the silent proof of a Republic's ingratitude. The undersigned has noticed with indignation this shameful neglect, and feeling a warm desire to wipe the charge of ingratitude from his country's name has painted three views of engagements during the late war which will be engraved. The first—a view of the action between the Wasp and Frolic. The second—a view of the battle between the Hornet, commanded by Capt. LAWRENCE and H. B. M. Ship Peacock. and the third—The Rescue of the crew of the Peacock by the Boats of the Hornet.

"These views will be engraved in Mezzotint in the highest style of the art by American artists and will be afforded to subscribers for $3 per copy, in advance. The proceeds deducting the expenses of the Engraving and Printing, will be vested in the hands of Trustees, and applied to the purpose of erecting a Monument to the memory of Captain LAWRENCE. The work to be performed by Native Artists, and to be constructed of American Marble.

"I appeal to every true-hearted American, to embrace this opportunity, giving them the honor of bestowing their mite towards the erection of a monument to the memory of one who sacrificed his life for our good; let our motto be,

'DON'T GIVE UP THE SHIP.'

GABRIEL HARRISON."

"The following distinguished Gentlemen have kindly and Patriotically consented to form a Board of Trustees:

Governor WILLIAM C. BOUCK,
Maj. Gen. George S. Dought,
Maj. Gen. Charles W. Sandford,
" John Lloyd,
Commissary Gen. Henry Storms,
Brig. Gen. George P. Morris,
" William L. Morris,
" Thomas S. Cummings,
" Frederick E. Mather,
Captain John T. Cairns,
" Alexander Purdy,
" Thomas N. Cazneau,
" John Mayher,
Ex. Lieut. Gov. Luther Bradish,
Robert H. Morris, Esq.
M. M. Noah, Esq.
N. P. Willis, Esq.
Wm. C. Bryant, Esq.
Horace Greeley, Esq.
Fitz Greene Halleck, Esq.
Henry C. Atwood, Esq.
Moses Y. Beach. Esq.
John Crowly, Esq.
H. J. Conway, Esq.
G. A. Worth, Esq.
Charles P. Harrison, Esq.

On his return from Albany a meeting of the Committee took place at the Arsenal, at which a resolution was passed desiring Mr. Harrison to bring his pictures there for a private exhibition. To this exhibition three of the best artists of New York were invited, for the purpose of critically examining the pictures, with a view to determine whether they were really of suffi-

cient value to be engraved. Thomas S. Cummings was Chairman of this Committee of artists. It is unnecessary to say, the pictures were declared to be of great worth, while the young artist was by all most generously congratulated. The opinions of the press at the time may be gathered from the following notices taken from the New York papers. The Daily News contains the following:

The Lawrence Monument.—We take the following description of the painting from the *New York Military Argus*:

" 'ACTION BETWEEN THE WASP AND FROLIC.'

"In our last number we briefly alluded to the proceedings of the 'Lawrence Monument Committee,' and also mentioned having seen one of the three paintings by Mr. Gabriel Harrison, from which the engravings are to be taken and furnished to each subscriber to the monument for the purpose of defraying the expenses of its erection.

"This painting it must be understood, is the work of a young and entirely self-taught artist, it being only five years since Mr. Harrison, as an amateur, first took pencil in hand. In giving our judgment on this picture we do not pretend to do so by strict critical rules, but altogether from the effect produced on us by its natural beauties, which are most striking, although we believe it will stand the test of the severest criticism in all points of art.

"The painting represents the moment when the Wasp runs the Frolic aboard on the larboard bow under a heavy fire from her quarter and bow guns, the red glare from which is reflected on the bows of the Frolic, and partially tinges the volumes of smoke which curl up and obscure a portion of the American vessel. The shock of the two vessels coming in contact has caused the Frolic to heel over slightly to the starboard, placing her rather in a perilous situation, while the discharge of the heavy guns from the Wasp has made her recoil, partly burying her hull in the crest of the angry wave which leaps around her, dashing its white foam in spray from the sides; this is to the life.

"The sky presents a lowering appearance, and is very neatly colored. Many times have we witnessed such a sky at sea, where alone it can be seen. Rays of light from above faintly stream down on the two vessels, seeming like a sorrowful gleam from the eye of heaven penetrating through the dark and heavy clouds. This watery sun light, if we may be allowed the expression, is managed by the artist with great skill, and serves as 'twere, to light up his picture, and yet allowing it to retain the sullen gloomy grandeur of stormy cloud and ocean.

"The vessels are both well and truthfully drawn; the eye of a nautical man can discover no inaccuracies; and to our judgment, and we are happy to say to the judgment of others of well tried and known critical taste, it is a natural painting of truth and spirit, reflecting great credit on the artist, and fully deserving the purpose to which it is applied."

The next is from the Herald.

"Monument to Lawrence.---The project to erect a Monument to the gallant Lawrence, we are gratified to learn, has been received with universal favor, and there is scarcely a doubt that the patriotic efforts of the gentleman who originally suggested the means by which it can be accomplished, will be crowned with success.

"The Board of Trustees, of which Governor Bouck is President, is composed of gentlemen of acknowledged patriotism and liberality, and we trust that our fellow citizens will co-operate with them, in an undertaking to commemorate the worth and virtue of one of the brightest and bravest ornaments of our gallant navy."

The Sunday Times expresses the following opinion:

"The Monument to Lawrence.---This noble enterprise is going bravely on. At a large and enthusiastic meeting held at the Arsenal, the picture representing the engagement of the Wasp and Frolic was exhibited. It is a magnificent painting, and worthy the pencil of an older artist. The representation of the mist and the smoke of the guns upon the water are admirable. In short, the whole picture does credit to Mr. Harrison, who first conceived the project of erecting a monument to the gallant Lawrence. He is a young self-taught artist, but is destined to assume a high rank in his profession. We hope the citizens of New York will co-operate in the matter, and pay a just tribute to the memory of one who fought and died for his country, and show the world that the American people, although tardy, are not ungrateful."

From the Sun.

New York, Sunday Afternoon,
21st July, 1844.

To Gabriel Harrison,

Sir---Having read in the columns of the New York "Argus" your prospectus for erecting a Monument to the memory of Captain James Lawrence; and believing it to be, as you there declare, "an enterprise which has been suggested by the purest patriotism, and an abiding desire to see justice done to the memories of the brave men who gave their talents and their lives to their country's service,"---I, as a citizen of this republic, although a stranger to

yourself, cannot refrain from conveying to you thus the admiration your enterprise has awakened in my mind, and which sentiment must fill the bosom of every American, for the man (a private individual) whose love of country and veneration for its heroes has given impulse to an enterprise already exerted upwards of two years, for the purpose of redeeming his country from the stigma of ingratitude to one of its departed heroes.

Sir, your appeal to every true-hearted American, to embrace the opportunity you have offered them of bestowing their mite for this purpose, must be cheerfully responded to,

> "Lives there a man with soul so dead
> Whom never to himself hath said
> This is my own, my native land ?"

Let us hope—not one. And if this remembrance be cherished, this love felt for our native land, what must we feel for the heroes who have fought, bled and died, to substantiate its glory and defend its rights ?

Yes, s r, I repeat with confidence, your patriotic appeal must be responded to by every American in the manner you desire. You must prosper in this undertaking. Is there one of your countrymen who will not cheerfully give his mite towards filling up the subscription for the three Paintings named in your Prospectus—1st, The Action between the Wasp and Frolic ;—2nd A View of the Battle between the Hornet, commanded by Captain Lawrence and H. B. M. ship Peacock,—3d, The Rescue of the Crew of the Peacock by the Crew of the Hornet."

The names you have united as a Board of Trustees give evidence of success. At the first meeting of this Board, which I am rejoiced to observe will take place this week, no doubt such steps will be taken, in arranging a proper committee of action, as will speedily carry into effect your patriotic enterprise and I trust you will be enabled to thank all othe: authorities and committees for the able manner in which they have encouraged and sustained you, in much the same way as the celebrated Doctor Johnson did Lord Chesterfield who, at the conclusion of the Doctor's gigantic literary labor, his Dictionary, complimented him highly on the work, and offered his assistance &c. in its publication. The Doctor politely thanked his Lordship for the extent of his patronage and his very valuable assistance, but declined accepting either, remarking, now that he had circumnavigated the vast ocean of letters, and safely arrived within sight of port, he could dispense with the pilotage of his Lordship's little cock-boat, and would find secure anchorage for himself.

May this be your case, sir, and may you proudly boast of having, by your own energy and perseverance, given another proof of the indomitable charac.er and spirit of the American people, which has caused the eyes of the world to be fixed upon them, and millions to exclaim "they are a great and enterpising people."

Your motto, sir, like your purpose, should be purely American—"First be sure you're right, then go ahead," and "Don't give up the ship."

If you suceed, and with this motto you must, a monument will arise to the memory of the hero Lawrence, perpetuating his fame and his country's gratitude, and your individual enterprise will receive the admiration and thanks of millions, of which number, allow me, sir, to subscribe myself, ONE.

Immediately subsequent to this, and while the fire of laudable patriotism was yet burning in the bosoms of the committee already named, a sub-committee was appointed to make arrangements with Mr. John Sartain, of Philadelphia, to engrave the plates ; for each of which he was to receive five hundred dollars. The pictures were transferred to Mr. Sartain and he began the work.

By this time Mr. Harrison had expended nearly four hundred dollars in forming his committee, in advertising, printing and framing ; beside the immense loss of time, which was to him of the utmost importance. But, as is usual with these excessively patriotic furors, after one or two meetings had been held, he could seldom procure the attendance of more than four or five of his committee. Of course the whole project crumbled to the earth through the most shameful neglect, while the artist was permitted to lose all he had ventured in the noble enterprize, together with his pictures (worth at least three hurdred dollars,) as Mr. Sartain held, *and still holds them*, for the work which he had completed in the first plate.

After experiencing so perfect a failure and the utter want of generous and national zeal among others, most men would have totally abandoned the undertaking, but there are souls which remain undaunted through the most searching trials, and Mr. Harrison's was one of these. Such men form the true spirits of an age, and to them the rest of the world gaze with wondering eyes—incapable of discerning the operation of a measure the glorious incentive to which is entirely beyond their weak and timid imagining. If he could not perfect his de-

sign as projected on his original design, he could change the features of his glorious strife, and thus accomplish something for the ashes of the heroic Lawrence.

He had performed his part—he had completed his pictures, but the engraver would not continue his work without being furnished with his pay. Mr. Harrison's means were exhausted—all gone for an unaccomplished object, still he was undaunted, and with the dying words of the brave Lawrence, "Don't give up the ship!" burning in the utmost recesses of his soul, he looked about him for some new and more effective mode of warfare. That terrific weapon—the pen—presented itself, and though unaccustomed to controversial engagements, he commenced a series of severe and startling articles against the vestry of Trinity Church. The publication of these cost him one hundred dollars; when, in the very midst of his hottest fire, he was requested to discontinue writing. At the same time he was informed that a meeting of the vestry had been held and a resolution passed to place a new monument over the grave of Lawrence.—They at last did so, and the work reflects much credit upon their taste and feeling, yet the merit of its erection *belongs exclusively* to Gabriel Harrison, as it is hardly probable, that had he not turned his attention to the subject and raised the whole nation in a storm of worthy indignation, the sightless mass of crumbling bricks would still have been the only monument to the dauntless Captain of the Chesapeak.

Young Harrison has been already richly rewarded for his noble sacrifices in this worthy cause, for during the past summer, while at Newport, Rhode Island, he was accidentally discoved by the widow of Captain Lawrence, who treated him with marked attention, and called him, as he truly is, "The preserver of her dear husband's grave!" She presented him with a copy of the portrait of her husband, which was done by the great Stewart.

Mr. Harrison was at Newport taking daguerreotypes, when he was accosted by an elderly lady, as he stood at the door of the gallery, with the question "I believe you take likenesses here?" He replied that he did, and asked her in. She began examining his collection, when her eye was arrested by one of his cards upon the table. "Gabriel Harrison!" said she, reading the card;—"do you know Gabriel Harrison?" He replied, "I am Gabriel Harrison, madam." "I thought so!" exclaimed the lady—and was excessively overcome.

This was the widow of Captain Lawrence, and when she recovered, she stated that she supposed he was Gabriel Harrison, when she first accosted him, but was not certain.

She invited him to dine with some young officers, at her house, and he was astonished upon entering the parlor, to find a rough daguerreotype likeness of himself, hung up by the side of her husband's picture. It was by this likeness that the noble lady had been enabled to recognize him at the door of the gallery.

But we are running too free in advance of our history. In 1844, a New York paper spoke of Mr. Harrison as having "brought destruction on himself and family by his unceasing endeavors to raise a monument to the memory of Lawrence. It will be remembered that after he had spent a considerable sum in endeavoring to produce a patriotic feeling on the subject, the committee on whom he relied for assistance forsook him; and his meritorious conduct was passed by without one mark of the approval of his fellow citizens. Even the editors of the ———, by *some accident*, neglected to give him credit for the engraving he presented to that paper, even on the day it adorned its pages."

The same year (1844,) bank note printing became rather unprofitable, and Mr. Harrison was compelled to turn his attention elsewhere in order to procure a sustenance for himself and family. His artistic eye soon fell upon daguerreotyping, and he resolved to make himself acquainted with the process. For this purpose he shortly after made application to Mr. John Plumbe, who was at that time at the head of the profession. After being but two weeks in Mr. Plumbe's establishment, Mr. Butler, Mr. Plumbe's head man, very kindly gave him permanent employment. Here he remained over three years, where he soon became a favorite with Mr. Plumbe's customers, and contributed as much toward his fame, as any one in his employment.

In 1845, when at the Washington Fair, D. C., Mr. Harrison's picture of Martin Van Buren, and one of a boy clinging around the bust of Washington, which was placed on a pedestal, were highly extolled in numerous papers, and took the first premium.

He was perfectly delighted with daguerreotyping, and ascertained directly that the art was capable of being greatly extended and largely improved. This he perceived with regard to the tone of pictures, while he saw that but few daguerrians paid much attention to position. Coming from a family of artists, and being himself a painter, he had great advantage over most of the operators; nor did he lose time in testing the accuracy of the opinions he had formed of the capabilities of the process. Most of those engaged in the profession appear to have regarded it as merely a mechanical and chemical operation; seldom experimenting upon graceful position, bold folds in drapery or proper tone to pictures. Having paid much attention to these points, Mr. Harrison began at once to examine the choicest works on art, such as Alliston's and Reynolds's Lectures on Art, from which he derived immense advantage in his new pursuit. Rapt and enthusiactic in his profession, the moment that he conceived the delightful idea of throwing a portrait into a finished picture, his next endeavor, after a proper study of drapery, was to change the usual cold, frosty tone (so common in ordinary daguerreotypes,) in order to produce decidedly those three tints positive, high lights, middle tint, and shadow; without which no painting, drawing or daguerreotype can be considered good. In these efforts Mr. Harrison has been extremely successful, and his pictures have drawn the highest enconiums from such men as C. C. Ingham, C. E. Elliott, Doughty, and many other distinguished artists.

By many he has been declared to excel any other daguerrean in the country, and by all it is admitted that he is not surpassed. The superiority of his skill is evinced in the fact that he now does more work *for artists* than any other in the profession in the city.

Mr. Harrison's active disposition and rather nervous temperament has also had the effect of causing him to be somewhat mingled in politics. In 1848 he took an active part in the Free Soil cause. He was a member of the Corresponding Committee with John Van Buren, Benjamin F. Butler, and others. He was likewise chosen a representative of the twelfth assembly district for the Utica Convention, which resulted in the choice of Martin Van Buren as a candidate for the presidency. At that convention he made a speech which was very highly extolled by his friends, and gained him much credit with his party. Mr. Harrison was also a delegate to the first Judicial Convention held in accordance with the new constitution of this State. His friends have frequently solicited him to become a candidate for the Legislature, but he has invariably declined, on the ground that it requires lawyers and not artists to make laws.

In 1849 Mr. Harrison went into the daguerrean gallery of Mr. M. M. Lawrence, 203 Broadway, where he has done more to establish his fame as a daguerrean, than at any other place; from the fact that Mr. Lawrence possesses the most eminent artistic judgment—is an excellent friend—a most worthy and estimable gentleman, and will have the very best material and instruments without regard to their cost. If a daguerrean cannot improve and excel in the establishment of Mr. Lawrence, and amid the abundant facilities there afforded, he can have neither the taste or judgment for an artist. With such a friend and the most liberal supply of best material, Mr. Harrison has attained to the first position as a faithful, tasteful and artistic daguerrean.

Mr. Harrison is the first person who has produced *descriptive daguerreotypes*—that is—put poetry in types as well as in pictures. One of these specimens which is greatly admired, is styled, "Past, Present, and Future." Artists and poets have been lavish in the commendation of this exquisite picture, and so delighted have they been with his beautiful fancy sketches in daguerreotype, that he is now almost universally known as the *Poet Daguerrean.* Indeed the poets have taken him into their special favor. One of his sketches represents his son, George Washington Harrison, clinging around a pedestal upon which rests a bust of the immortal Washington. This charming conception has been made the

subject of some delightful verses which we give below, from the pen of the distinguished Eliza C. Hurley.

Aye, cling around that pedestal,
  Look up thou bright eyed boy,
Behold thy country's ornament
  Which time will not destroy.

Cling to his mantle till it falls,
  About thy graceful form,
'Till admiration for his worth,
  Doth thy young senses warm.

'Tis honor at his feet to kneel,
  Glory is in the deed,
For by his greatness and his might,
  Thy country, Boy, was freed.

Look up,—Look up, 'tis Washington!
  Oh! fix on him thy gaze,
His noble, his heroic mind
  Fill'd Nations with amaze!

Strain every nerve to reach the mark,
  The height to which he soar'd;
Who proved the glory of his day
  By the whole world ador'd.

Mr. Harrison is likewise the first operator who has, to any degree been successful in taking what are called "double whole plate pictures;" that is—pictures three times the size of any heretofore taken. This single fact speaks volumes for his untiring energy and consummate skill.

It is pleasing to find that in the midst of his laborious employment Mr. Harrison still pursued his favorite design of painting, employing his leisure moments upon original designs of landscapes. He has produced three or four pieces which do credit to his taste in composition, and his accuracy as an artist both in drawing and coloring. His "Pathway to the Mountain Torrent" has drawn forth the warmest and well-deserved praise of Doughty, Ingham, Fisher, Elliott and others of distinguished reputation; who all welcome him among the painters, and look forward to the eminence he must attain if he continues to paint. Mr. Ingham, the Vice-President of the National Academy of Design, has given him the most flattering encouragement, and urged upon him to persevere in his delightful and successful pursuit.

For some unknown cause the American Art Union has treated Mr. Harrison most shamefully. They first invited him to send his pictures to their Gallery, that the managers might make purchases of him. After keeping each picture for five or six weeks, they returned them to him with the frames broken and disfigured; and, as we understand, *without explanation*. These facts coming to the ears of a few of Mr. Harrison's friends, among them Judge Waterbury, John Cochran, Benjamin F. Butler, John A. Dix and John Van Buren, they declared that a young American artist of such great merit, should not be thus cruelly cast aside for want of patronage. They have therefore very kindly purchased all the paintings which the Art Union so insultingly turned away.

And now—after years of hardship, Mr. Harrison finds himself beginning to reap the reward of his incessant application and unwavering fortitude. With his credit as a finished daguerrean drawing constant attention toward him, and his progress as a painter raising up for him a host of friends among the most accomplished and distinguished in the art, while he is yet a young man; we predict for him a brilliant position amid the most eminent of his countrymen. And, yet, he was but a poor friendless and untutored boy, and has been compelled to submit to insults in places where courage and genius such as his should have been fostered and protected. When his darling project of raising a new tomb to Lawrence was accomplished—the ashes of the hero were transferred to their new resting place without pomp or display. The military made no effort, the vestry no plan to commemorate the event. Mr. Harrison himself made arrangements for firing a salute over the grave, and paid *the money in advance*, in order to secure the fulfilment of his desire—a proper form which the carpet knights of the street columns had mysteriously forgotten and neglected. The day and the hour arrived, but the salute was not fired. Mr. Harrison was not present, and no signal announced the second deposit of the remains of Lawrence. Some of the papers of the day laid all the censure upon Mr. Harrison, and contemptuously asked where he was. It would have been much more noble to have inquired first privately, and if there was cause found, they might have sneered. Had they made the least effort for the man who had done so much in so good a cause, they would have discovered that at the precise hour when the salute was to have been fired,

Mr. Harrison was standing at the grave of his devoted mother.

We have now traced Gabriel Harrison through his checquered and eventful life, and the reader cannot have failed to mark the uncommon energy and determined resolution of the man throughout. It is to these qualities that he owes his success in his various occupations and pursuits. Overcome by no reverses—staid by no obstacles—vanquished by no accumulating disasters, with the object of his ambition constantly before him, he has advanced step by step in his onward course. His path has not been through the gay aisles of a flower garden where the rich perfumes of nature surrounded his way; but it has been over the steep cliffs and the rugged and stony road of trial and difficulty, where the sufferings of those near and dear to him have added to the cup of his affliction. A weaker heart or a soul less devoted to the consciousness of truth, would have often paused by the way and stood appalled at the threatening clouds that gathered around him; but he seems to have collected new strength at every requisition made upon his fortitude, and under the most severe and cutting rebuffs, he has risen unexpected to fresher exertions—more toilsome labor and more exalted flights toward the temple of fame. There is a vacant niche in that glorious fame yet to be filled with the name of Gabriel Harrison.

SNELLING & FISHER'S QUICK WORKING CAMERA BOX.

It is now nearly four years since we first conceived the idea of applying electro-magnetism to taking Daguerreotypes instantly. At the time, we were not in possession of any facts which went to prove the feasibility of accomplishing such a desideratum, but it having entered our mind, we pondered over it for several months, endeavoring to fix upon some plan by which it might be attained.

While we were writing our history and practice of the Art of Photography, we had occasion to mention it to our friend Col. Whitney, editor of the Republic Magazine, and he did us the favor of communicating for the work, an experiment which he had made with the galvanic battery while operating at St. Louis, Mo., seven years before. This gave us the determination to invent an apparatus for the purpose.

We had one constructed on a small scale, but owing to its imperfection we could not make it work, in consequence, principally, of the fumes of sulphuric acid penetrating into the inner chamber of the box, and counteracting the photogenic effect. We then had a second made, much larger, and slightly different, and were again foiled from two causes.

Owing to the necessity of constructing the inner slide of the box in a certain way, the light was admitted into the top of the box and impinging upon a portion of the plate, obliterated the image where it fell. The connection between the poles of the battery was also too defective for the purpose; the points being directly opposite the magnetic fluid passed in a direct line across the plate, with such intensity as to completely oxidise the coating and silver surface, at that part, while it had no effect on the rest of the plate. We were in a measure warned of this result before making the experiment, and had resolved in our mind what course to pursue if it really occured. We therefore, immediately made a slight change in the plate-holder; but although we partially succeeded, we were dissatisfied. The effect of the light admitted at the top of the box, notwithstanding it was covered with a black cloth, was not remedied, and the action of the magnetic fluid was by no means satisfactory. We were convinced that the con-

struction of the box must be essentially different from either of those we had made, and the poles of the battery so arranged that the magneto-electric fluid should pass instantly over the whole surface of the daguerreotype plate.

Owing to the multiplicity of calls upon our time at this stage of our experiments, we were obliged to postpone any further investigation until a future period. Many of our evenings were, however, devoted to the study—many plans were formed, but abandoned almost as soon as conceived. In fact, so varied were they, and all appearing equally worthy of trial, that we were at a loss which to commence with. Our experiments we found expensive, and we were unwilling, or rather unable to meet them, if we took up each of our plans, as they came before our mind's eye.

In this condition of affairs we one evening encountered an old friend—whose whole life had been devoted to the fine arts and sciences, and whose talent and genius as a portrait and landscape painter is world-wide—J. K. Fisher, Esq. This gentleman informed us that he had invented a new kind of camera box, and invited us to call and see his drawings of it, which we took the earliest opportunity of doing.

He explained the diagrams and the nature of his invention. We perceived that for the object intended, it was a valuable improvement provided there were no optical objections. At all events we saw before us a portion of the very thing, which, by slight alterations, we were desirous of obtaining.

We had filed our caveat for a patent, previous to the construction of the second box, and as Mr. Fisher informed us of his intention to patent his improvement, we made a proposition to him to combine the two inventions and include them in the same patent, for which we were to make suitable compensation. This was accordingly done.

After constructing an instrument after the combined plan, we found that our surmises in regard to the laws of optics were correct, and we were obliged again to alter it. We, however, received a new idea from the experiment. We discovered that there was strong probability that we could, by certain modifications of the instrument, which we shall probably introduce hereafter, enlarge the image on the plate to six or seven times the size it appeared on the ground-glass, which would enable us to take with a half-size camera, a picture nearly if not quite as large as those produced with a double whole size tube. We are, in fact, confident this can be done. It will, however, involve considerable expense in the first instance; but, we think, not so much as the cost of a double whole-size camera.

We will go still farther and say that we believe it possible to obtain full length pictures the size of life with a camera of the full size. This assertion may be startling, but were we to explain the principle of the operation few, we think, would doubt it. We shall make the experiment as soon as we have the opportunity and means, and give the result publicity.

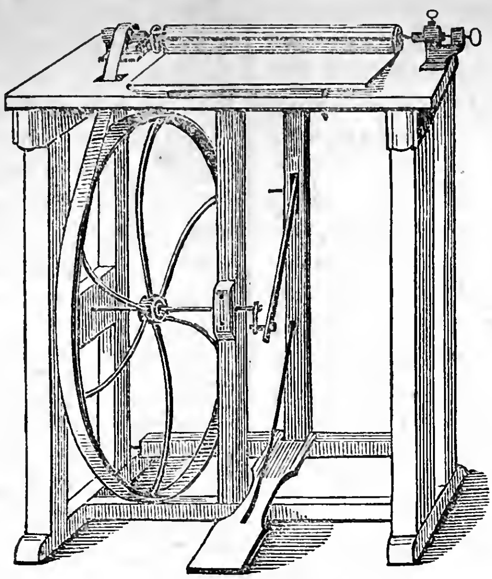
With Mr. Hill's process for producing Daguerreotypes in the natural colors, and this instrument, what a splendid portrait or landscape could be produced!

To return to our box. The alterations made after the first experiment with the combined invention has at last met our expectations, and we find that we can now control time to our pleasure. If we wish to take a portrait or view instantly, we can do it, if we wish to prolong the time to one, two, or five seconds, we can do it.

This is not the only advantage of our invention. Producing the portrait or view naturally, and with equal boldness and rapidity is a consummation that has ever been most earnestly desired. Keeping the box free from dust is another most important consideration and it will in a measure remove one great difficulty in daguerreotype manipulation—one cause of the spotting of the plate.

We have already enumerated its other advantages, in our February number. We have labored long and hard, and met with every kind of difficulty in bringing this improvement to perfection, and we trust the Daguerrean artists of America will not be "*backward in coming forward*" with their orders for the box. They will reap ample remuneration. One artist informed us that if we succeeded it would save him at least one thousand dollars a year.

We shall give an engraving of this box with a more full description in our next.



HARRISON'S NEW BUFFING WHEEL.

This excellent article, of which the above engraving is a faithful representation, is, to our mind, the very best yet offered to the Daguerrean artist for polishing his plates. The polishing surface is a roller about 2 1-2 inches in diameter, and 18 inches long, running on steel pinions set after the manner of the common turning lathe and put in motion by a treadle.

The rapidity with which the roller revolves enables the operator to buff his plate in one-fifth the time required by most wheels, and it is sufficiently large for the largest size plate.

This wheel was invented by C. C. Harrison of New York, is made by W. A. Allen, and sold by E. Anthony, 205 Broadway. The price of the wheel is $50.

Mr. Allen, we understand, has applied for a patent.

LIGHTS AND SHADOWS OF DAGUERREAN LIFE.

NO. ONE.—BY GABRIEL HARRISON.

Aurora had again lifted the spangled veil of night and the faint glow of a September sun dawned in the bustling city of Gotham. Bright birds were busy among the Park trees carroling their morning's welcome and making the mild air bewitchingly sweet with their melody. *Aqua-fontana* dashed up from its subterranean bed in one grand crystal column, cresting over and sparkling in the sunbeams like a shower of rubies and diamonds until fading into a mist of transcendant splendor it disappeared in the basin below—brief yet beautiful—too beautiful so soon to part with—yet a sad emblem of man's destiny on earth.

Man—now ploding along in the underground depths of society and rushing forward to seek an opening by which he may rise above those who surround him—and as he proceeds, building castles in the air, speculating upon the gains of adventures to be undertaken in distant climes—ripe in expectation of the usurers cent per cent—the banker's interests—the lawyer's fame—the soldier's renown—the preachers glory— or the merchant's profits—thinking little how his gains might make the poor poorer—on

he rushes, the opening is reached, he ascends, he dazzles the less successful with his splendor, but in a brief space falls again to his original level to give place to those who followed him, unless, indeed, he, by good and great deeds, crystalizes himself as it were, on the altar of fame—certain it is however, that on the morning in question there was one making tracks towards securing the shadow before the substance faded.

It was in the year 1844 when operating for Plumbe, that sleepy John, as he was called—and who, by the by, we were often obliged to toss in a blanket to keep his winkers and blinkers from being everlastingly shut—one morning conducted into room No. 8, which happened to be my sanctum sanctorum, a rather tall, slick, shingle-like specimen of the genus Homo, feminine gender, whose every look and motion indicated her to be an old maid.

After certain movements peculiar to such productions she drawled out—

"Well Mister, I want to have my dog-re-o-type taken and put into a case with a red cover."

I assured her it should be done and retired to prepare the plate, leaving her seated in the operating chair. I soon returned and after fifteen minutes hard labor succeded in arranging her shapeless limbs in a somewhat flattering position; but just as I was about to draw the slide, I observed that her breathing moved her head sufficient to prevent a good result in the camera, and remarked to her to be careful and not suffer her respiration to move her head while the picture was being taken; I then drew the slide and retired to my side-room.

At the expiration of about sixty seconds I heard, to my dismay, a loud drawling, Oh, me! I rushed into the room, John after me, when lo and behold, there she lay, stretched out at full length on her chair, her head back, her mouth livid with blue, and uttering just audibly—

"I can't hold my breath any longer."

This was enough for John, who, thinking that she was either going to faint or die, flew to my stand, seized a large bowl of hyposulphite solution, and returning, dashed the contents into her face. The screech that followed this operation was truly awful.

She sprang to her feet and flew at poor John with the ferocity of a tigeress, around the room they went, he throwing down camera stands, chairs, tables, and everything that came in his way, to impede her progress. At last he darted out at the door, rushed down stairs and through the reception room, where there were many persons waiting for their pictures, shouting at the top of his voice "Mad woman! mad woman!"

I do not know whether they took the cry for mad dog or not, but certain it is, those in the gallery were in an instant following him down stairs in the most frightful consternation. A large mob was soon collected around the door, and when I descended I found three or four gentlemen endeavoring to raise a Lamberthian lady, who, in her flight not being able to descend sufficiently rapid had rolled from the top to the bottom, without much injury, however, to her immensity. Soon the tempest of excitement was calmed, and the poor operator whose labors in his fascinating art the world can never fully appreciate, was wending his way homeward

The incident of the day was so vividly impressed upon my mind that I was compelled to laugh out occasionally in the street. All out doors seemed to know of the affair, and went grinning and giggling by—even the doors and windows and grim walls of the buildings winked and blinked and opened and shut with laughter. The sun, too, as it sank behind the hills of Weehawken tinted and gilded fantastic little clouds into shapes and forms commemorative of the event.

What a contrast to this scene were the events of the next day. The sun rose gloomily, no bright birds with their sweet music appeared to herald in the day—no *aqua fontana* sparkled in the sun-beams, for a bleak north-west wind, and dark fleeting clouds gave token of a wintry approach; and oh! how sad was the face of the first customer who saluted me on entering the Gallery.

Her pale lips, though motionless, spoke despair—her dark sunken eyes told of intense suffering, and her black tresses raggedly gathered over her broad white temples indicated the agitation of her mind. Her garments coarse, but neat, loosely encircled her well shaped frame. When she spoke, her tremulous, anxious voice sent a thrill

like an electric shock through me. In wild accents she addressed me.

"Oh! sir, my child Armenia is dead, and I have no likeness of her; won't you come immediately and take her picture."

The number and place were taken and in a few minutes I was at her door. The house was an old dilapidated frame building in Elm-street. I gently knocked at the door and it was soon opened.

"Does Mrs. G—— live here I asked."

"No, sir; down in the basement."

Into a deep cellar basement I descended—the door was partly open, I walked in and what a mournful scene met my gaze; the dying embers in the grate gave more light than the heavenly rays which entered through the low windows. On a scantily furnished couch lay the victim of the fell destroyer, marble like and cold—the mother, on her knees beside the bed leaned over her darling, her only child, with her face buried in her hands, and giving way to low heart-rending choaking sobs. For a moment I dared not disturb that mother's anguish.

"Madam."

"You here," she said, as she started to her feet. "Oh! a thousand, thousand thanks!"

Gently we moved the death couch to the window in order to get the best light, though but a ray. What a face! what a picture did it reveal. Though the hand of God is the most skillful, yet I thought, had the sculptor been there to chisel out that round forehead, to form that exquisite shoulder, to mark the playful smile about those thin lips, and to give the graceful curves of those full arms that lay across her now motionless heart, what a beautiful creation would come from his hands.

The mother held up a white cloth to give me reflected light to subdue the shadows. All was still, I took the cap from the camera. About two minutes had elapsed, when a bright sun ray broke through the clouds, dashed its bright beams upon the reflector, and shedding, as it were, a supernatural light. I was startled—the mother rivetted with frightful gaze, for at the same moment we beheld the muscles about the mouth of the child move, and her eyes partially open—a smile played upon her lips, a long gentle sigh heaved her bosom, and as I replace dthe cap, her head fell over to one side. The mother screamed—

"She lives! she lives!" and fell upon her knees by the side of the couch.

"No," was my reply; she is dead now, the web of life is broken."

The camera was doing its work as the cord that bound the gentle being to earth snaped and loosened the spirit for another and better world. If the earth lost a flower, Heaven gained an angel.

From Arthur's Home Gazette.

ARTISTS OF AMERICA.—JOHN J. AUDUBON.

BY C. W. WEBBER,
Author of "Old Hicks," "Shot in the Eye," &c., &c.

John J. Audubon is dead! The 28th January, 1851, will be memorable through all coming time, as the day on which the great master of Illustrative Art passed from earth. The nation should be in mourning at this event. We have not produced so many remarkable men that any demonstrations of public grief, however stately and imposing, should be spared on such an occasion. The pageants would rather do honor to ourselves than to a renown which is already co-extensive with the limits of civilization.

But Audubon had nothing of glory to ask of us. The world had taken charge of his fame, and its fruition began many years ago, in a foreign country, when Cuvier at once pronounced his great work, the most splendid monument which art had yet erected to Ornithology." It is fortunate that it is so! Before the world had thus spoken concerning him, we had already weighed the poor young artist and his noble enterprise in the same scales on which we rolled our pork and cod-fish barrels, and had found him wanting; and, had our national vindication of his good name been necessary now, the same sagacious sneers which met him then, and drove him in despair to seek for patronage abroad, would no doubt have been at the service of his family and friends now. Certainly we have proven ourselves illustrious patrons! magnanimous masters! in reference to the two greatest names we have yet produced in science and art, Franklin and Audubon. The one, to this day, without a monument; the other, driven first an outcast from our midst, martyred to a sublime dedication we could not comprehend, and then, as obscurely thrust aside into his grave as if he had really been the despised pauper we would have made him, had he vainly trusted our appreciation of labors that have placed his name along with those of Cuvier and Humboldt, among the foremost of the century.

But, John J. Audubon has built his own monument higher than idle domes can reach! His own indomitable and extraordinary energies have created, in the Birds of America, a more gorgeous mausoleum than ever did unaided enthusiasm before, single handed against such tremendous odds. Indeed, in all the World's History of wonderful men, there is not to my mind, one story of life so filled with beautiful romance! It seems a dream. It seems almost utterly unreal, that, in spite of the ignorant and sordid prejudices, which in this country have taken special delight in wreaking themselves upon all that is exalting and beautifying in art, and that made his early life one incessant and disheartening struggle with pecuniary difficulties, he should have achieved this marvelous triumph; should not only have completed his great work, but have *made it pay* at $1000 a copy! No Yankee will fail to fully appreciate this part of the achievment; but, we doubt, somewhat, whether such acute calculators, with all their shallow flurry of go-ahead-a-tiveness, concerning which they vapor so much, would be able to comprehend the dedication of unconquerable energies to science and his art, which has enabled him to make, after their own fashion, and expend in holy faith after his own, two or three fortunes in the service of God through nature, and of elevating his race! What a spell his deeds has been to all free hearts and true, for the many long years past!

Audubon! delightful name! Well do I remember what a hold it took upon my young imagination, when I heard the fragmented rumor from afar, that there was a strong man abroad then, who lived in the wilderness with only his dog and gun, and did nothing day by day, but follow up the birds; watching everything they might do: keeping in sight of them all the time, wherever they went, while light lasted; then sleeping beneath the tree where they

perched, to be up and follow them again with the dawn, until he knew every habit nd way that belonged to them. That when he was satisfied, he would shoot them in a way not to tear their plumage, and then sit down on the mossy roots of an oak, and with nobody to connoisseur for him but his wise looking dog, and the squirrel that stamped and scolded at him from the limbs above, he would draw such marvelous pictures as the world never saw of birds before!

Oh, what a happy, happy being that curious man must be! I used to think; and what a brave one too, to sleep out among the panthers and wild cats, and where the Indian whoop was heard—trusting only to his single arm and his faithful dog. I loved to speculate about that dog. He must be larger than my dog "Millo," I thought, and just about as gentle and true, but a *little* more knowing. How I envied him the happiness of such a master and such a life. As for the master, what magical conjurations of a charmed fancy I loved to associate with him. He must be noble and good, and wear such lofty calmness upon his brow. I had an ideal of physical perfection, and below it could not bear to conceive that so heroic a philosopher could fall. What a martyr spirit his must be: and what a holy enthusiasm leads him on through tangled swamps where the Cougar yelled, Alligators roared, and hideous serpents with their wavy spotted lengths, the green scum of stagnant pools; up difficult mountains, where the rattle-snake sprung its deadly alarm amidst the mossy fissures of the crumbling stones, and the eagle whetted his hooked beak upon the crag-points; or, beneath the profound shadows of primeval forests, where the few sunbeams that straggled through at noonday, looked like gold dust scattered over the black earth; down the destructive flood of mighty waters, or beside crystal lakes set in a columner rim of giant cypresses; and on the sky-bounded ocean-heaved prairies, or where the green and glinting icebergs thundered crashingly against the hoar cliffs "of fretted Labrador," or the "tropic gulf" hurled at the low "Keys" its foaming mountains; through, amidst and over all, his dauntless spirit was passing, led away by the winnowing sound of wings.

What a poetical enchantment there was to one in such a life! What sights of awe and of beauty he must see. What images of touching truth—of odd, peculiar humors he must have stored. And that magical power he was said to possess, to tame in colors the very waves upon the leap, and the arrowy Albatross upon the plunge into its beaded crest! All these were so surprising and miraculous to me, that I wondered in my simplicity, whether such devotion was not sinful, and such surpassing works would not bring upon their author persecution and imprisonment for necromancy, as the story books told had been the case of old. It seemed to me too much bliss and too many gifts for a single mortal to enjoy! I felt, now envious; but a deep emulation was stirred within me by such thoughts. I vowed in my inmost thoughts that I would first *see* all those things for myself, with my own eyes; where and *as* he had seen them—out upon the broad face of the extended world—and then I could look upon his work and know with an appreciative knowledge, whether he had wrought these miracles or not.

This resolve gave much of its tone to my after life. Many a tie was rent, and much agony endured by my friends, when I became an unrecking wanderer through wild and distant regions. The uttermost arms of our tremendous seaward floods saw me amongst their springs. The salt and trembling Gulf tossed me upon its southern shores, and broad savannah swelled in my westward course into undulating plains; and they yet rose across their wearisome breadth, into tall, rounded hills, that grew apace with crags upon their heads, until heap upon heap far glinting through the clouds, the pinnacled sharp rocks climbed upwards and the vast forest of crags spread its white bloomy tops among the stars. My restless step was everywhere; my eager eyes saw all that our great continent could show. The grizzly bear and the tropic bird were equally known to me. The savage trooper and the Mexican slave had been familiars, as well as the fierce bandit, and the stern simple-hearted hunter. Years of my earlier manhood passed in these erratic wanderings. I had grown familiar with all wild, grotesque and lonely creatures that populate those infinite solitudes of nature, "that own not man's dominion." The visions and the passions of my boy-

hood still haunted me, and the rustling of free wings by my ear yet awakened all pleasant images. Now, I felt that I had a right to know and see, face to face, that remarkable man whose deeds and life had so much occupied my imagination—who had so made a living really out of what had been to me the poetry of life—aye, a poetry which had with me stronger

> "Than stipulations, duties, reverences,"

and driven me far and wide, an April shadow chased before the fitful wind! Should I ever see him? The eager questioning lived about my heart whenever I heard his name. I returned home, "the prodigal son," my spirit much tamed and chastened; yet the old leaven fermenter deep beneath the calmer surface.

Not long had my restless steps been still. I was again a traveler. Our boat landed one morning about daybreak at Pittsburg—that singular city that looks as if it had been built over the very gates of Acheron. Soon as I made my appearance in the raw, foggy air, upon the wharf, early as it was, I was surprised by scores of "strikers" and agents of the different hotels and transportation lines. Amidst the yells and deafening clamors of contending claimers on every side, I permitted myself to be bodily ravished into a coach, and hurried off, bag and baggage, for—the word of the darkey "striker" being accepted—"the most splendiferous hotel in the city!" As it happened to be the one I knew, and had selected beforehand, I was content to take his definition of its superlative excellence.

Before I reached my destination, the coach was hailed from a street corner, and a fellow, muffled in a pilot cloth, sprang in and took a seat beside me. To my no little astonishment, he seemed to take the most sudden and peculiar interest in me, and greatly to the exultation of my inward consciousness of deserts, prepared a series of the sharpest questionings as to my whereabouts "when I was at home"—my destination, and above all, my *route*—with the roundest and most voluble protestations as to the affectionate interest he felt in seeing that *all* travellers, especially *such* looking ones as I was, were properly warned of the complicated impositions and knaveries practised habitually upon them, by the many transportation lines in this wicked city; and to wind up this touching exordium, he frankly assured me that the "Stage Route" across the mountains was the cheapest—the most safe—the *genteelest*—and altogether *the* route he would recommend to such a gentleman as me!

The milk of human kindness was somewhat stirred in my veins, responsive to this gratuitous exhibition of a broad philanthropy—but as it happened that I had determined upon the "Canal Route," I waived, with the most thankful acknowledgments, any present committal, and gratefully accepted the card he thrust into my hand. But, as it most unfortunately occurred, I found the office of the "Canal Route" for Philadelphia, &c., was next door to the hotel, and I was tempted, weakly enough, no doubt! to go in and book my name "clear through." Insensate creature that I was! The canal boats would not start till after dark, so that I spent the hours allotted to daylight by the cathedral clocks, in exploring the streets of this dim Cyclopian city.

The incessant clang of sledge-hammers had become sufficiently monotonous when the evening closed in, and I was glad enough to take coach and be transported to the Canal Depot, when the usual vexations and delay consequent, had to be endured. Finally, however, we got underweigh, with such a cargo of pigs, poultry and humanity, as even canal boats are seldom blessed with. I stood upon tiptoe for the fresh air in the cabin, until the time had actually come when people *must* go to bed; when that awful personage, the Captain, summoned us all together, and informed us that every man, woman and child aboard, must stow his, her or itself, away along the face of the narrow walls, in the succession of their registration during the day. Now, it happened that as gentlemen are not usually up before daybreak, that I stood first upon the first list, and was of course entitled to the first choice of hammocks. We panted in the centre of the close-jammed crowd, waiting till the ladies, who always take precedence in America, had been called off. Now, as it happened that this right of choice was finally definitive for the route, and determined whether one should sleep upon a hammock, or the floor, or the tables, for several successive nights—it was a matter of no little moment.

It occurred while the ladies were being disposed of, that I heard above the buzz around me the name of Audubon spoken. My attention was instantly attracted by that magical sound. I listened in breathless eagerness. I heard a gentleman near me say—" Mr. Audubon is last on the list; I fear he will not get a bed, we are so crowded!"

I felt my heart leap.

"What," said I, leaning forward quickly, "is it possible Monsieur Audubon can be aboard? I thought he was still on his Rocky Mountain tour!"

"We are just returning, sir," said the gentleman, courteously, half smiling, as he observed the excited expression of my face.

"But, you are joking, are you not?" said I, hardly able to realize so much happiness. "He cannot *really* be in this boat. Where? Which is he?"

"He *is* actually in this very cabin," said he, turning full upon me.

"The man of all others in the world I wanted to see most," I ejaculated, half inwardly.

"Well, there he is," said the gentleman, laughing, as he pointed to a huge pile of green blankets and fur which I had before observed stretched upon one of the benches, and took to be the fat bale of some Western trader.

"What, *that* Mr. Audubon?" I exclaimed, *naively*.

"Yes; he is taking a nap."

At that moment my name was called out by the Captain as entitled to the first choice of berths."

"I waive my right of choice in favor of Mr. Audubon," was my answer.

Now the green bale stirred a little—half turned upon its narrow restings, and after a while, sat erect, and showed me, to my no small surprise, that there was a man inside of it. A patriarchial beard fell, white and wavy, down his breast; a pair of hawk-like eyes gleamed sharply out from the fuzzy shroud of cap and collar. I drew near, with a thrill of irrepressible curiosity. The moment my eyes took in the noble contour of that Roman face, I felt that it was *he*, and could be no one else. Yes, it was Audubon in his wilderness garb, hale and alert, with sixty winters upon his shoulders, as one of his own "old eagles feathered to the heel,"—fresh from where the floods are cradled amid crag-piled glooms, or flowery extended plains. He looked as I had dreamed the antique Plato must have looked, with that fine, classic head and lofty mien! He fully realized the hero of the ideal. With what eagar and affectionate admiration I gazed upon him, the valorous and venerable sage!

What a deathless and beautiful dedication his had been to the holy priesthood of nature! I felt that the very hem of his garments—of that rusty and faded green blanket, ought to be sacred to all devotees of science, and was so to me. What an indomitable flame, that not

"The wreakful siege of battering years"

could quell, must fire that heroic heart. To think, that now, when "Time had delved its parallels upon his brow"—when he had already accomplished the most Herculean labor of the age in his "Birds of America"—still unsatisfied, he should undertake a new, and as grand a work, upon the animals, and now he was returning with the trophies of science gathered on his toilsome and dangerous journeyings! Ah! how I venerated him! How I longed to know him, and to be permitted to sit at his feet and learn, and hear his own lips discourse of those loveable themes which had so absorbed my life.

I scarcely slept that night, for my brain was teeming with novel and happy images. I determined to stretch to the utmost the traveler's license, and approach him in the morning. My happy fortune in having been able to make the "surrender" in his favor, assisted me, or else his quick eye detected at once the sympathy of our tastes; be that as it may, we were soon on good terms.

Like all men who have lived much apart with nature, he is not very talkative. His conversation was impulsive and fragmentary:—that, taken together with a mellow Gallic idiom, rendered his style pleasingly tittilating to a curious listener, as I was eager to get at his stores of knowledge, and compare my own diffuse but extended observation, with his profound accuracy. The hours of that protracted journey, glided by as in a dream. I was forever at his side, catching with a delighted eagerness at those characteristic scraps that fell from his lips.

I was anxious to obtain an accurate insight into the man—the individual. I found rather more of the world about him, than I was inclined to expect, though every inch of him was symmetrical with his character of naturalist, and many inches are there in that, growing through tall cubits into the Titonic girth. He had several new and curious animals along with him, which he had taken in those distant wilds where I had myself seen them in their freedom, and now they looked like old acquaintances to me, and I soon got up an intimacy with the Swift Fox, the Snarling Badger, and the Rocky Mountain Deer. He exhibited to me some of the original drawings of the splendid work on the Zoology of the continent, which his sons are now engaged in bringing out. I recognized in them the miraculous pencil of the "Birds of America." But I observed several personal traits that interested me very much, and which I will relate before dismissing this account of our accidental intercourse. The confinement we were subjected to on board the canal boat, was very tiresome to his habits of freedom. We used to get ashore and walk for hours along the tow-path ahead of the boat; and I observed with astonishment, that, though over sixty, he could walk me down with ease. Now, I am something of a walker, and am not very far advanced in years, and though I do not exactly affect the nimbleness of Cleopatra, who was seen to

"Hop forty paces through the public street,"

yet I pretend to very respectable ambulatory powers. Though, I say, I would not enter in a match with Gildersleeve, Col. Stannard, Kit North, John Neal, or anybody else, who has pedestrinated himself into an Olympic Crown; yet I do set up to be a walker, and I was not a little confounded at seeing this old man leave me, panting to the leeward. His physical energies seemed entirely unimpaired. Another striking evidence of this he gave me. A number of us were standing grouped around him, on the top of the boat, one clear sunshiny morning; we were at the time passing through a broken and very picturesque region; his keen eyes, with an abstracted, intense expression, peculiar to them, were glancing over the scenery as we glided through, when suddenly he pointed with his finger towards the fence of a field, about two hundred yards off, with the exclamation,

"See! yonder is a Fox Squirrel, running along the top rail. It is not often I have seen them in Pennsylvania!"

Now his power of vision must have been singularly acute, to have distinguished that it was a *Fox* Squirrel at such a distance; for only one other person out of a dozen or two, who were looking in the same direction, detected the creature at all, and he said he could barely distinguish that there was some object moving on the rail. I asked him curiously, if he was sure of its being a *Fox* Squirrel. He smiled, and flashed his hawk-like glance upon me, as he answered;

"Ah, I have an Indian's eye!" and I had only to look into it to feel that he had.

These are slight but peculiar traits, in perfect keeping with his general characteristics, as the naturalist and the man. Of course, I never permitted that acquaintance to fall through, and amidst the many and wearisome vicissitudes which have befallen me since, I have retained fresh and unimpaired the memory of that journey through the mountains, as one of the green places of the past, where the sunlight always lives.

[TO BE CONCLUDED IN NEXT NUMBER.]

GOSSIP.

The minds of Daguerreotypists have been much absorbed since our announcement, in the January number, of the discovery of Mr. Hill, in regard to taking Daguerreotypes in the natural colors. Many believe in its accomplishment, while a large majority still set it down as an impossibility. A very short time will prove the correctness of Mr. Hill's statements, as an offer has been made him by a gentleman of high standing in New York, whose ability to execute what he has proposed is undoubted, which no sane man can well refuse, and we hesitate not to say that it will be accepted if the discovery has really been made, for it is the only course by which Mr. Hill can possibly expect to reap any advantage—as it appears that he is not the only one who has been for some time experimenting successfully with the view of producing colors.

— We would here take occasion to speak of Mr. Davie's labors in the Daguerrean Art. His name has long been before the profession, and we have before alluded to some of the improvements he has introduced both in the chemical department and the mechanical. His reputation as an artist also stands high, and he has exhibited some pictures which have had no superior. His last invention—"The Photographer" as he calls it—is a very unique affair and will be of great service to the operator—particularly those whose business is very extensive—as it is intended to reduce the labor of the operating room one-fourth. Mr. Davie now has one of these machines in daily use in his rooms at Utica, which he says, meets his most sanguine expectations. It clips the corners, bends the edges, cleans and polishes the plate, ready for the camera at one operation, and in one-fourth the time of the ordinary operation. We shall probably give an illustration, with a description of this important invention in our next.

— We see by the papers that a gentleman by the name of Hayden, of Connecticut, has made several valuable improvements in Photography. We are not informed by them, however, of their nature, but from what we can learn from private sources, they consist in taking positive impressions on paper without first resorting to a negative. This has been done before in Europe by Talbot, Robert Hunt, Claudet and others, as may be seen by reference to our "History and Practice of the Art of Photography."

We take pleasure in recording such facts as the following from "Arthur's Home Gazette."

The superiority of our Daguerreotypes over those produced in Europe is known to most persons who are familiar with current facts in art. T. Buchannan Reed, a young American artist now in Italy, writing to the Editor of the Cincinnati Commercial, refers to this subject, in a paragraph, which we extract. He says:—"Previous to leaving Cincinnati, I possessed myself of a few daguerreotypes, which were taken by Faris and Hawkins, and wherever they have been seen by artists and others in England, Germany, and Italy, they have been pronounced to be the finest specimens ever beheld in these countries. One, a large plate by Mr. Faris, has attracted so much attention and admiration, that it is continually lent out and passed around as a curiosity, showing how far the new world has beaten the old, even at her own inventions. A friend of mine yesterday exhibited this one to a French daguerreotypist in Florence,

who stared over it with eyes like saucers, and shrugged his shoulders up to his ears and exclaimed, "Vive l'Amerique!" recognizing at a glance that it was not European. He acknowledged, without any hesitation, that he had never seen anything in his line of art to compare with it. To be convinced of the truth of this, one has only to look at the specimens which adorn the show cases here; they remind me of those "half dollar" establishments to be met with so frequently in our eastern cities. I cannot understand why, in this old world of art, daguerreotyping should be so far inferior to what it is in America; nor have I heard any satisfactory explanation. The operators, when they pretend to give any reason, lay the blame upon the weather. In London this might be a good and sufficient reason; but in Italy, especially, the atmosphere can scarcely be the sole cause for so much difference. I am inclined to think that good chemists in this country have not, as in ours, turned their attention to the subject."

To the cause attributed by Daguerreotypists of Europe for the superiority of American pictures a happy answer was given by—we believe Mr. Claudet—an English gentleman to a fellow-member of the Royal Photographic Society.

"If, said the gentleman," "the superiority of American Daguerreotypes is owing to the advantage of a clearer atmosphere than that of this country, why is it that the American artists resident both in England and France excel us?"

Such a query was unanswerable. We do not pretend to give the exact words of the gentleman, as we have to draw upon our memory, but the above is to the same effect. It is not in the atmosphere that the cause exists, for we could name more than one English gentleman who has made attempts in New York to get daguerreotypes equal to those of our own artists, and have been entirely unsuccessful.

The following poem was written in 1841, when Daguerreotypes less bold and distinct than now, were more like flitting shadows. It breathes a spirit of pure religion as well as renders a just tribute to the Daguerreotype art:

ON SEEING A DAGUERREOTYPE PORTRAIT.

BY MRS. C. H. PUTNAM.

What means this vain, incessant strife,
  To hide thyself in fitful gleams—
Now standing like a thing of life?
  Then fading like a poet's dreams.

More like a fiction fancy weaves,
  Than ought we know of earthly kind—
Or visioned form that memory leaves
  Upon the tablets of the mind.

The shadowy flitting of a thought,
  O'er recollections misty page;
From secret depths intrusive brought,
  And vanished quick by reason sage.

I like thine airy semblance well;
  It speaks of forms in spirit land,
Where kindred souls together dwell,
  A pure, unspotted, happy band.

It tells me of that better state,
  Where sin and sorrow never come;
But peace and joy for ever wait,
  And purest pleasures ceaseless bloom.

It tells me, too, that those we love,
  And cherish in our hearts below,
Shall wear those well known forms above,
  And only brighter, purer grow.

Who can be without a Daguerreotype of him or her they love? that embodiment—as it were, of the form's spirit—that exquisite and perfect impress of the features? Yes, it does raise the mind from earth to heaven, and bring to the imagination the fairy, spiritual forms of the dear departed, and makes us hope and wish to join them in eternity.

— Lerebours' Photography, which we commence in the present number is an excellent work, and the most popular in Europe, of any heretofore published there, three editions of 1800 copies having been sold in three years. We commend it to the attentive perusal of every artist.

— It will be perceived that we have commenced in this number a series of articles on the Artists of America. This series will embrace all the prominent American Painters and Sculptors of the past and present. It will not be possible for us to pursue any systematic arrangement of these biographies, owing to the difficulty of always procuring the material when desired. The daguerrean art is so intimately connected—some sage philosophers to the contrary, notwithstanding—with those of painting and drawing, that we think it will be beneficial as well as entertaining to the Daguerreotypist to read the lives of those who have been eminent in their profession.

— We have no doubt as to our Daguerreotype exhibitors at the World's Fair, coming off with flying colors. We will venture to say that the world never saw such perfect specimens of the art as will be there exhibited. They are really superb, both in design and execution. We have engaged an excellent writer who intends visiting the Fair to make notes while there, of all he hears and sees in regard to these pictures, and we can give our readers promise of a most interesting and instructive feast in reading his communications on the subject. In the meantime we shall here give a supplementary notice of those who are to exhibit.

We shall not pretend to criticise as we have not sufficient time to give them more than a passing inspection.

Mr. Brady sends about thirty groups and portraits, which, for uniformity of tone, sharpness and boldness we have never seen surpassed. Two or three of them we noticed especially as very fine—the head of Mr. J. Perry—a group of females—and the head of the eccentric carman of John Street. Mr. Brady's reputation will be much enhanced by these pictures.

Mr. Lawrence sends three frames full, of sizes varying from the quarter to the double whole. The variety of tones in his specimens will show the world that our operators are not confined entirely to one style of excellence, but that equally good pictures may be given of any tone. The pictures which struck our fancy most were the double whole sized head of Colonel J. Watson Webb—a light-toned full length picture of a lady—one of a child, and the beautifully conceived group of three young ladies representing the past, present, and future.

The Mead Brothers, send twenty-four pictures, three of which are groups. These specimens will fully sustain the reputation already acquired by these gentlemen. Their alegorical pictures of Europe, Asia, Africa and America, especially, will command attention for their happy conception, fine grouping and execution.

W. A. Pratt & Co., of Richmond, Va. sends a grand national gallery of pictures which will be much admired for the artistic taste displayed in their arrangement as well as for their excellence as Daguerreotypes. The centre picture is a full size portrait of the Governor of Virginia. This is surrounded by portraits of the most distinguished men of that State; the whole forming a *tout ensemble* of excellent arrangement and superior Daguerrean skill.

We are told that the Messrs. Roots of Philadelphia send some fine specimens, but we have not seen them, nor received any description of their character.

Mr. Whitehurst will furnish the world of visitors at the great Fair with a sight that will not only surprise but delight them, and we think the enterprise he has exhibited in getting up his specimens will repay him far beyond his expectations. He will there exhibit twelve splendid views of the Falls of Niagara on double whole size plates. This was a grand conception of

Mr. Whitehurst's which will undoubtedly attract more general notice than anything at the fair. The very idea of a Daguerreotype of Niagara would naturally cause surprise; what astonishment will, therefore, be created when twelve, equally good, are exhibited before the assembly of all nations.

—We take the liberty of making a few extracts from a letter, now before us, from W. A. Pratt, Esq., as we think they will be as interesting to our Daguerreotypists as they are to us. Mr. Pratt, will please accept our thanks for his favor and allow us to hope for further communications regarding his experience.

Mr. Pratt gives the following directions for producing his medallion pictures; a style very much admired by a large portion of our people.

Cut an oval opening in the centre of a piece of Bristol board, the size of the plate on which you wish to operate, and surround the edges with other openings—of any form your fancy may dictate—to resemble lacework. After coating the plate, place the Bristol board over the coating, and let it remain during its exposure in the camera, and over the mercury. In taking a picture in this way it is necessary to have a large oval cut in a white screen, say two feet long, to correspond with the oval on the plate. This is to stand between the sitter and camera, and being taken white on the plate produces a beautiful effect in contrast to the black of the polished silver.

Mr. Pratt also gives a description of his rooms, the arrangement of which strikes us as being so good for the exhibition of Daguerreotypes that we cannot refrain from copying it entire. He says:

" We have just completed a new and splendid gallery in which we have introduced a combined light formed of a north window eight feet wide and thirty feet high, in the manor house gothic style, and having in connection with it a sky-light six feet by eleven.

" In my show room I have made an improvement by making it semi-circular; taking in the entire street front. Three windows light up the surface of the curved wall; each point of which is equally well adapted to show pictures. On a line with this curved wall I have, first, a divan of crimson velvet, to the height of three and a half feet; then black velvet, plumb with the wall, five feet; and then at an inclination of 1 in 3 to the seven feet point, divided and capped by gilt mouldings, so that the pictures are all hung at the right angle, both with the floor and windows, to see them to the best advantage.

" The lower sashes of the windows are of crimson and yellow stained glass so that the light received on the pictures is from the upper sashes altogether."

We would state, in order to make it more plain to the reader, that the semi-circular wall is placed opposite to the windows. Mr. Pratt's description is accompanied by a drawing of the room, and we regret that it came too late to be engraved for this Journal. A room furnished as he describes must be really beautiful.

National Academy of Design.—The annual exposition of paintings and statuary will be opened to the public about the first of April. No art incident at all approaches in general interest, this periodical display, embracing as it does, not only contributions from all the best artists of the union, but the choicest efforts of their muse; the saloons of the academy being looked upon both by the profession and the critics as the grand arena in which contested laurels are to be won and awarded. An intelli-

gent observer cannot fail to keep himself very respectably informed as to the progress and condition of American art, and the bearings of the popular taste, if he is careful to review these successive exhibitions. During the quarter of a century already passed since the foundation of the academy, its galleries have shown a steady and most encouraging advance ; and from the extraordinary efforts which the members and artists generally are making for the coming 26th annual exhibition, a highly gratifying result may be safely anticipated.

— Various rumors having been lately circulated in regard to Mr. Hill's great discovery for obtaining Daguerreotypes in color, to the effect that he had appointed an agent in this city for the transaction of his business in relation to the process—which agent had an interest in the discovery—and, also, that Mr. Hill had selected five Daguerreotypists of New York, to whom only the secret was to be imparted, we made inquiry of Mr. Hill as to their truth. He informed us in the most solemn manner that there was not one word of truth in them. He assured us also, that he should strictly adhere to the intention expressed in his letter which we published in our February number ; that he had made no arrangement whatever with any person, although many had annoyed him exceedingly with all manner of oft-repeated and monopolizing propositions—and we think some men show little sense and self-respect, as well as consideration for Mr. Hill, in subjecting him to the persecutions of which he complains. He, therefore, authorised us to say for him, that he has not yet made any arrangement, nor will he until such time as he is enabled to do so without the least embarrassment.

He seems favorably disposed to the offer mentioned in the first part of this month's Gossip, and we hope for his own sake as well as that of all Daguerreotypists, that he will accept it. It is certainly the most praisworthy and democratic, and will prove the most lucrative to himself.

To those who have made inquiry of us on the subject we will say, that we have not the least hesitation in assuring them that Mr. Hill has succeeded in discovering *a process for impressing upon the Daguerreotype plate an image in its natural colors.* All colors can be obtained—even yellow—with the exception of *chrome yellow.* Nothing delays Mr. Hill in his arrangements for making his discovery known, but his desire to overcome the difficulty of getting that color as perfect as the rest.

Cautions to be strictly observed in preparing and using the Photogenic Paper. — 1st. Remember that if the Photogenic fluid falls upon the substance, it will make an indelible black stain, and cannot even be removed from the hand until the skin peels off.

" 2nd. Be particularly careful that the paper, when used, is perfectly dry, or there will be danger of staining the object laid on it to copy. If perfectly dry, it will not injure the most delicate piece of lace.

" 3rd. The vessels into which the fluid is poured must be glass or earthenware, and the brushes must not be set in tin, nor must metal of any kind come in contact with the fluid.

" 4th. Take great care that none of the solution of salt drops into the fluid ; it would render it turbid and almost useless.

5th. The paper should be prepared by candle-light or in a room lighted through yellow glass.

6th. Immediately after using the brushes in the fluid and solutions, let them be well washed in water.

7th. No more of the fluid should be poured out than can be used at the time, as there is danger in pouring it back into the bottle, that some trifling portion of salt may be mixed with it, which would render the liquid turbid.

8th. To avoid the danger of staining the fingers or dress, the vessels employed in the process should be thrown into a basin of water *directly* they are done with. We recommend gloves to be worn while the paper is being prepared.

It is absolutely necessary, to the obtainment of a clear drawing, that the object to be copied should lie close to the surface of the prepared paper.

It is best to cut the paper into the requisite sizes by candle-light, and to mark the back of each piece so that it may be know at once; for, if there is any delay, the surface undergoes a partial change of color, and the drawing is less distinct.

— We shall give a receipt, in our next number, for making an entirely new article of first coating, which we hesitate not to say, will entirely supercede the present method of using dry iodine.

— The large number of letters we are constantly receiving from Daguerreotypist's throughout the country must be our apology to those who do not receive immediate answers. All will receive attention in regular course. We are always pleased to receive those evidences of interest for our undertaking, and shall strive to retain the expressions of friendly regard so liberally bestowed upon us.

— Many of our Daguerrean friends have expressed a desire to possess a copy of the the splendid engraving of the United States Senate Chamber. We have, therefore, concluded to offer it as a prize to any artist who will send us five subscribers and twenty-five dollars. Five artists might club together, and afterwards decide by lot, or otherwise, to whom the engraving shall belong.

— We unintentionally neglected to mention, in our first number the artists who designed and engraved the title page of our cover. It was drawn by Mr. John Chapin, and engraved by Felton, two of the best artists we have in this country.

— We acknowledge the receipt of a fine engraved portrait of the eminent artist and naturalist, J. J. Audubon, whose biography we have commenced in this number, which will illustrate the April number. Mr. Arthur of the Home Gazette will please accept our thanks.

— We should be pleased to receive the communication promised us by Mr. Wattles, at as early a day as possible. Mr. A. H. of Illinois, will also accept our thanks for his promise, and we trust he will not suffer too much time to pass before it is given to his Daguerrean brethren. It is to such able minds as his that we are to look for inprovement and instruction.

— Having all our arrangements completed and systematized, we trust to be enabled to publish our future numbers on the 15th of each month.

Lith by F D'Avignon

323, Broadway N Y.

ENGRAVED EXPRESSLY FOR THE PHOTOGRAPHIC ART JOURNAL

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THE

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RESEARCHES ON LIGHT.*

BY ROBERT HUNT,
Secretary to the Royal Polytechnic Society.

PART I.
The influence of the Solar Rays on compound bodies, with especial reference to their Photographic application.

SECTION I.—*On Metallic Compounds.*

CHAPTER III.
Platinum.

IN 1832 Sir John Herschel communicated to the British Association at Oxford the curious fact, that when a solution of platinum in nitro muriatic acid has been neutralised by the addition of lime, and which has been well cleared by filtration, is mixed with lime-water in the dark, no precipitation to any considerable extent takes place—for a long while, indeed, none whatever; though after long standing, a slight flocky sediment is formed, after which the action is arrested entirely. But if the mixture, either freshly made, or when cleared by subsidence of this sediment, is exposed to sunshine, it instantly becomes milky, and a copious formation of a white precipitate (or a pale yellow one if the platinic solution be in excess) takes place, which subsides quickly, and is easily collected. The same takes place more slowly in cloudy daylight.

By exposing this mixture to Light which had permeated different colored fluids, it was found that the action was confined entirely to the violet end of the spectrum. Sulphuric tincture of red-rose leaves protected the fluid entirely: an exposure of many days to full sunshine behind this fluid occasioned no precipitation, but it takes place instantly if exposed to full daylight, as copiously as if it had been all the time kept in total darkness. Yellow fluids, particularly a solution of the bichromate of potash, also serve to defend it.

When a solution of the chloride of platinum, as neutral as possible, is mixed with a saturated solution of the cyanate of potassium also boiling, a percyanate of potassium and platinum results. If paper is washed with this solution, and exposed to sunshine, a very faint change only is apparent, even after prolonged exposure. If, however, after a short time the paper is taken into the dark, and washed with a solution of the protonitrate of mercury, a very pretty, though delicate positive picture results. The only mode by which anything like manence can be given to these pictures when formed, is by washing them in a dilute warm solution of carbonate of soda. Nearly all the PLATINOTYPES, however, slowly fade in the dark.

On allowing the above solution to cool, a great number of minute crystals of a yellow color are formed. By dissolving these in water a solution is made which imparts to paper a much higher sensibility than the last named preparation.

If either of these two papers, after they are taken from the Light, be washed over with a solution of the nitrate of silver, a positive picture is brought out, but it is, although perfect, exceedingly faint. If in this state, the paper is exposed to sunshine, it blackens over the portions which were uncovered, whilst the covered parts remain

* Continued from No. 3, page 145.

light, the result being a good negative picture.

If the solution of the percyanate of potassium and platinum is washed over paper, and after it is dried a solution of the protonitrate of mercury is applied, the paper becomes of a yellowish-brown tint. Exposed to sunshine, it gives a very peculiar picture, which will be either negative or positive, according to the depth of color that comes on, which is exceedingly capricious. The exposed portions often pass into a beautiful vermillion color, which, however, fades with some rapidity, leaving the ground of the paper a buff or ruddy brown.

Prismatic Analysis.—The action appears to commence at the same time or nearly so, in the yellow ray and in the blue. Commencing in the blue ray, the change of color or reddening, goes on through the violet ray; but it is confined, or very nearly so, to the visible spectrum. In the yellow ray, a very positive blackening at first comes on; but this gradually passes away, and a bleaching action results. This bleaching is evident in copying of plants on this kind of paper, the parts covered by the green leaves becoming pale as the other parts darken.

Percyanate of potassium and platinum, with one washing of nitrate of silver, affords a very pleasing result. The pictures procured on this kind of paper being of a well-defined deep lilac tint. A great many combinations of these two salts have been tried, and some of them gave very pleasing photographs. If the nitrate of silver is in slight excess, and particularly if the silver is applied to the paper first, the impression is quite as strong on the wrong side of the paper as it is upon the right one. The iodide of potassium promises to be the most successful fixing agent for these kinds of platinotypes; but after a few months, although carefully preserved in a portfolio, little more than a blank sheet of white paper is left.

If, in addition to the nitrate of silver, we unite some corrosive sublimate, on the paper with the platinum salt, an exposure of fifteen minutes produces but little apparent effect. If, however, on removing it from the Light, the paper is washed over with strong ammonia, a picture of intense blackness, on an iron-grey ground, is immediately produced. Heat brings the whole of the paper to one uniform iron-grey tinge. If the picture is placed in a solution of corrosive sublimate, a negative picture is very speedily produced by the dissolving out of the shadows.

Chloride of Platinum spread on paper undergoes some change very speedily, although this is not often evident until it is afterwards washed over with the protonitrate of mercury. A great variety of combinations have been made the subjects of experiment. The chloride of platinum has been united with oxalic acid, tartaric acid, formic acid, and a great many of these compounds in which cyanogen plays an important part. The results have been pretty much the same in all: in some cases, the action of the solar rays is to deepen the yellow color of the paper, in others, to bleach it; and hence when the subsequent washing with the mercurial solution is given, sometimes a positive and sometimes a negative image results. All the combinations with the ferroprussiates have exhibited, by a decomposition of these salts, very pleasing blue grounds.

Iodide of Platinum.—Sir John Herschel was the first to call my attention to the sensibility of paper prepared with the iodide of platinum. In a few minutes a very decided image is formed upon it; but this very rapidly fades out, the sensibility of the paper not being at all impaired, even after repeated exposures to Light.

Bromide of Platinum exhibits the same peculiarities as the iodide. I have tried upon these preparations a great many fixing agents without being quite successful with any. It appears, indeed, to be a distinguishing characteristic of the salts of this metal, that, in the dark, they have the power of overcoming the change which has been produced by the solar rays, and of restoring themselves to their original state. The kind of change brought about by exposure to Light is not very evident; in some cases the yellow platinum salts are darkened, in others bleached; in either case, if these papers are put aside the original yellow is restored. It appears to me, that to a greater or less extent, this occurs with all the platinotypes, and I am inclined to regard the change as a de-oxidisation of the metal, which is again enabled during darkness to recover its lost portion of oxygen: but this is by no means certain.

In Sir John Herschel's Memoir on the Chemical Action of the Rays of the Solar Spectrum, some peculiar phenomena exhibited by the chloride and iodide of this metal are named, which it is important I should transfer to my pages, corroborating in a striking manner the capricious nature, under the influence of the solar rays, of the salts of this singular metal:—

"A solution of chloride of platinum in ether being washed over with a bibulous paper impregnated with hydriodate of potash, in certain degrees of strength and copiousness, browns pretty rapidly in the dark, but much more rapidly, and to a much deeper tint, in sunshine. A paper so washed and partly shaded, on exposure, produced a well-defined figure of the shading body, which, on the addition of a fresh wash of the hydriodate, *out of the Light*, became much more strongly contrasted with the surrounding ground.

"Paper washed with acetate of lead, and then with chloride of platina, is absolutely insensible, and only becomes very feebly so, when thoroughly impregnated with nitrate of silver. But if in place of the nitrate of silver, a wash of hydriodate of potash be superadded, the effect is remarkable. If the hydriodic solution be strong and plentiful, the paper is immediately colored dark brown, whether in Light or darkness. If very weak, no effect; but if applied of a certain intermediate strength though not *immediately* affected in the shade, yet, if held (while wet) in the sun, it darkens with extraordinary rapidity to the same deep brown hue, *and presently after*, *the exposure to the sun continuing whitens again.* A fresh dose of the hydriodate being applied, it again darkens, but is no longer capable of restoration, and the darkness goes on increasing to a fine deep chocolate brown."

From the powerful influence exerted by the oxalate of the protoxide of iron on the salts of platinum, I was led to hope that this combination might be brought under the agency of the sun's rays, to some extent. Experiment has proved to me that this is the case; but the action is not so much accelerated by the sun as to render its use of any photographic value. If a paper prepared with a tolerably strong solution of the oxalate, and a solution of the chloride of platinum, made neutral by carbonate of soda, is exposed, with one portion carefully screened, for only a few minutes, it will be found that the uncovered portion, is by far the darkest, and for a certain period this darkening goes on, even out of the Light, but after a time a bleaching action commences and, unless an additional quantity of the oxalate is applied, all evidence of solar influence is erased.

Having placed a number of photographs prepared with salts of platinum in a portfolio with others which had been spread on silver salts, I was somewhat surprised to find, that although the pictures on the platinum papers were faded out, very good images of these pictures upon a dark light ground, were left upon the argentine papers. This curious action would appear to point to a method by which these evanescent pictures may be made to leave very good positive images behind, by being placed in juxtaposition with other photographic papers.

CHAPTER IV.

Mercury.

It has long been known to chemists that the protoxide of mercury is very liable to resolve itself into the peroxide and metallic mercury, under the influence of the direct solar rays, or even of daylight. The peroxide also, it has been stated by Guibourt, is converted into metallic mercury and oxygen by long exposure. This I find may be effected with some degree of rapidity, and the peroxide used for the production of really interesting photographic drawings. If red precipitate is ground to a very fine powder, and well incorporated with gum water, it may be applied upon paper very evenly with a camel's hair brush, and it dries, forming a fine red surface. If paper thus prepared is exposed, with an engraving upon it, to good sunshine, for ten or twelve hours, all the exposed parts are deeply blackened, and those under the white parts of the engraving changed to a deep olive, thus giving a negative photograph, which is somewhat singular in its appearance and colors, which are red, olive and black. If these papers are, after having been thus darkened, washed with water, the peroxide of mercury is removed, and a faint brown stain only, left upon the paper, over the parts which were covered with the darkened oxide. I have

observed that the peroxide of mercury kept in a bottle, near a window, into which the sun shines during the greater portion of the day, slowly changes to a deep yellow color, and is, on the side next the Light reduced to a fine powder, which adheres with tolerable firmness to the glass.

Carbonate of Mercury, it is well known, parts with carbonic acid in contact with the air, and becomes brown, even in the dark. If, when recently prepared, it is exposed to Light, a very rapid darkening is brought on, which, it appears probable, may be advantageously employed in varying our photographic specimens. The best mode of preparing this kind of mercurial paper with which I am acquainted, is to wash good writing paper, with a saturated solution of the protonitrate of mercury. It must then be dried as quickly as possible, without bringing it too near the fire, which very rapidly, if hot, decomposes the salt, when in contact with organic matter. A moderately strong solution of the carbonate of potash is then applied. If exposed whilst wet, provided there is good sunshine, this preparation darkens to a good black in a few minutes. If carefully dried between folds of blotting paper, and exposed in a dry state, the darkening is still more rapid.

Prismatic Analysis.—The action of the spectrum, appears to be limited to a space, between the lower edgè of the blue and the extreme limits of the violet rays, over which the darkening is very rapid ; the other rays appear to be nearly without action, although by carefully heating the paper after exposure up to the point at which decomposition is effected, it becomes evident that some influence has been exerted beyond the visible violet, and also about the region of the yellow rays, as these parts are the first which exhibit any symptoms of change by calorific agency.

" Protonitrate of mercury, simply washed over paper, is slowly and feebly blackened by exposure to sunshine." This was first observed by Sir John Herschel, who, by taking advantage of the properties of some of the protosalts of iron, produced some very curious photographic results, which must now be described. If paper is impregnated with the ammonia-citrate of iron, and one portion of it being covered, the other part is exposed to the sun, and then washed with the protonitrate, this salt is slowly reduced over the sunned portion.

If the protonitrate of mercury is mixed with either the ammonia-citrate or tartrate of iron, a precipitate is produced. Sir John Herschel recommends one measure of a solution of ammonia-tartrate of iron, containing, each one-tenth of its weight of the respective salts; tartaric acid, a saturated solution, one-eighth of the joint volumes of the other solutions. Form a cream, by pouring in rapidly, one measure of a saturated solution of the protonitrate, and well mixing with a brush. This cream should be spread very quickly over the whole paper, well worked in, cleared off as much as possible, and finished with a brush nearly dry, spread out broad, and pressed to a straight thin edge, which must be drawn as lightly and evenly as possible over every part of the paper, until the surface appears free from every streak, and barely moist. The talented discoverer of this process goes on to remark, that " about half an hour or an hour according to the sun, affords pictures of such force and depth of color, such velvety richness of material, and such perfection of detail and preservation of the relative intensities of the Light, as infinitely to surpass any photographic production I have yet seen, and which indeed, it seems impossible to go beyond. Most unfortunately they cannot be preserved. Every attempt to fix them, has resulted in the destruction of their beauty and force; and even when kept from Light, they fade with more or less rapidity, some dissappearing almost entirely in three or four days, while others have resisted tolerably well for a fortnight, or even a month. It is to an overdose of the tartaric acid that their more rapid deterioration seems to be due ; and of course it is important to keep down the proportion of this ingredients as low as possible ; but without it I have never succeeded in producing that peculiar velvety aspect, on which the charm of these pictures chiefly depends, nor anything like the same intensity of color without over-sunning."

Sir John Herschel gives yet another very interesting combination :—" Let a paper be washed over with a weak solution of periodide of iron, and when dry, with a solution of protonitrate of mercury. A bright yellow paper is produced, which (if the right

strength of the liquids be hit) is exceedingly sensitive while wet, darkening to a brown color in a very few seconds in the sunshine. Withdrawn, the impression fades rapidly, and the paper in a few hours recovers its original color. In operating this change of color the whole spectrum is effective, with the exception of the thermic rays beyond the red."

(When we come to notice the iron salts, many other applications of mercurial preparations by this distinguished philosopher will be given.)

Deutiodide of Mercury formed with a persalt and the iodide of potassium. During good sunshine this preparation darkened very distinctly in fifteen minutes: an hour's exposure brought on a full brown color. If, after exposure to the sun, paper on which it might have been spread, is gently warmed by the fire, the brown color fades quite away, leaving the paper of a bright red.

The protonitrate of mercury has been combined with a great number of the organic acids and their salts. Some change is very evident upon all that have yet been tried, the sun, in spaces of time varying from five minutes to as many hours, producing very marked evidences of its decomposing power. The formates, benzoates, and gallates, are the most decided in their action; and if, after a short exposure, papers prepared with these salts are washed over with the oxalate of iron, tolerably good pictures are produced.

The pernitrate of mercury and the yellow subsalt which is formed when the nitrate is put into hot water, have both been made the subjects of experiment. They have, when used alone on paper, and when united with other metallic and alkaline salts, given decided evidence of change under the sun's rays, but not to such an extent, as appears to warrant any hope of their being of any photographic value.

Subnitrate of mercury and the benzoate of the hydruret of benzule, were united on paper, and in half an hour of good sunshine a very fair picture was formed, the darkened parts being of a deep buff color. The picture rapidly faded out, but it could at any time be restored by washing it over with the hyposulphite of soda, or the protosulphite of iron.

Nitrate of Mercury and ferroprussiate of potash.—Even in the dark the latter salt is slowly decomposed, and the paper discolored by the formation of prussian blue. In the sunshine this is very rapidly produced, after which a bleaching action comes on. If after the bleaching process has been carried on, until the paper is nearly white, it is removed from the Light, and washed over with a saturated solution of nitrate of silver, a positive image is produced. The protonitrate of mercury, and the red prussiate of potash undergo nearly the same changes as the above. The cyanates are not so marked in the changes which they undergo; but even those combinations which appear to be the least sensitive show, by the subsequent application of the proto-salts of iron, or the nitrate of silver, that definite action has been set up by the solar rays.

Chromate of mercury, formed from a solution of the nitrate of mercury and the bichromate of potash, is rapidly darkened under the first impulse of the solar action; it then bleaches, but somewhat more slowly. If papers thus prepared are now removed from the Light, and washed over with a solution of nitrate of silver, very beautiful pictures of a fine red color are produced: these are rendered permanent by washing with a very weak solution of a mercurial salt; at least as it regards Light. They still change under the influence of time, and some of the transformations which they undergo are exceedingly curious. They usually fade out entirely over the side of the paper which has been exposed, and on which the picture was at first formed; but as the picture vanishes from the front of the paper, it slowly developes itself on the back not of the same red color, but the metal is revived, and we have a semi-metallic picture of much interest. I have not yet procured any of these pictures in an entirely perfect state, although many have approached very nearly to it. Could we depend upon the change taking place in a regular manner, we should have the means of producing very beautiful and curious photographs.—(See *Chromate of Copper—Chromatypes.*)

Many other mercurial salts spread upon paper, and precipitated upon glass have been experimented with; and although no results sufficiently certain to warrant the publication of them have been obtained,

yet most decided evidences have been afforded that all these salts are liable to decomposition under the influence of the solar rays. On many of them the invisible radiations from hot iron have a very powerful effect; aud these are not, as might have been expected, much influenced by the calorific rays of the spectrum. This seems to point to some difference between the solar and terrestrial radiations.

CHAPTER V.

Iron.

For nearly the whole of the facts contained in this chapter we are indebted to the labors of Sir John Herschel. In his hands the salts of iron have become valuable photographic agents; and two or three processes which have been devised by this indefatigable experimentalist, in which the iron salts, play an important, if not the chief part, are among the most interesting within the range of the photographic art, whether we regard the beauties of the pictures which are formed, or the singular changes, which take place during exposure and fixation. I have, for my own pleasure, repeated all Sir John Herschel's published experiments with much care, but I believe I have but very little to add to what he has already observed and published. I shall therefore extract largely from Sir John Herschel's Memoir, and add such remarks of my own as may appear to explain any of the processes more fully.

The Chrysotype.—"Paper is washed with a moderately concentrated solution of ammonia-citrate of iron, and dried; the strength of the solution being such as to dry into a good yellow color, and not at all brown. In this state it is ready to receive a photographic image, which may be impressed on it, either from nature in the camera obscura, or from an engraving on a frame in sunshine. The image so impressed, however, is faint, and sometimes hardly perceptible. The moment it is removed from the frame or camera, it must be washed over with a neutral solution of gold, of such strength as to have the color of sherry wine. Instantly the picture appears, not indeed at once of its full intensity, but darkening with great rapidity up to a certain point, depending on the strength of the solutions used, &c. At this point nothing can surpass the sharpness and perfection of detail of the resulting photograph. To arrest this process, and to fix the picture (so far at least as the agency of *Light* is concerned), it is to be thrown into water slightly acidulated with sulphuric acid, and well soaked, dried, washed with hydro-bromate of potash, rinsed, and dried again."

Subsequently the talented discoverer of this process recommended the hydriodate of potash as superior to the hydrobromate as a fixing agent. "As soon as the picture is satisfactorily brought out by the auriferous fluid, it is to be rinsed in spring water, which must be three times renewed. It is then blotted off and dried, after which it is to be washed on both sides with a somewhat weak solution of hydriodate of potash. If there be any free chloride of gold present in the pores of the paper it will be discolored, the lights passing to a ruddy brown; but they speedily whiten again spontaneously, or at all events on throwing it (after lying a minute or two) into fresh water, in which being again rinsed and dried, it is now perfectly fixed."

If instead of a solution of gold the nitrate of silver is used, the picture is brought out somewhat more slowly, and as far as my own experience goes, with much less beauty, whether we consider color or detail.

Cyanotype.—This name has been applied by Sir John Herschel to the whole class of processes in which cyanogen in its combinations with iron form a leading part. The following constitute the most interesting of this class which Sir John Herschel has yet published.

1. A paper is prepared as above with the ammonia citrate of iron, and a latent picture is impressed upon it. If the action of Light has been carried on to the darkening of the paper, the picture is negative. Over this picture a solution of the ferroprussiate of potash, in which is dissolved a little gum arabic, is very sparingly but equally applied. As soon as this is done, the negative image vanishes, and by slow degrees is replaced by a positive one of a violet blue color on a greenish yellow ground. If when *dry* the picture is not so distinct as could be desired, a second wash is applied; and when the image is fully developed, which it is with exceeding

beauty if the operation has been carefully performed, the paper must be dried as speedily as possible. No fixing is required; the picture becomes pale in a very strong light, but it recovers its original color in the dark.

2. Mix together ammonia-citrate of iron and sulphocyanate of potash in solution, and to the mixture add a small quantity of nitric acid. If only a certain portion of acid be added, the resulting red liquid spread on paper, whitens spontaneously. This is not the case if more acid is added; but paper washed with the superacidulated solution, retains when dry a considerable degree of color, and receives a positive image with great rapidity, which appears more distinctly at the back of the paper than on its face. These impressions have not yet been successfully fixed.

3. With a mixture which may contain equal proportions of ammonia-citrate of iron and ferrosesquicyanate of potash prepare a paper, and impress it with a picture, after which throw it into water, and dry it; a *negative blue* picture will be produced. If this picture is washed with a solution of the protonitrate of mercury, it is in a little time discharged. The mercurial salt being thoroughly washed out, and the paper dried, the picture is susceptible of restoration. If a smooth iron is passed over it somewhat hotter than is used for ironing linen, but not sufficiently so to scorch the paper, the obliterated picture immediately reappears, not blue, *but brown*. However carefully kept, these photographs fade after a few weeks and disappear. A fresh application of heat restores them to full intensity.

4. This use of a mercurial salt led Sir John Herschel to devise an improvement on the cyanotype process, No. 1., which affords much more certain results and more decided pictures. One part by weight of the ammonia-citrate of iron is dissolved in eleven parts of water, this is mixed with an equal quantity of a saturated cold solution of corossive sublimate (bichloride of mercury). Before a precipitate has had time to form, the solution is washed over paper (which should have rather a yellowish than a bluish cast) and dried. This paper appears to keep well. It is exposed to Light till a faint, but perfectly visible picture is impressed. It is then washed over as rapidly as possible with a broad flat brush, dipped in a saturated solution of prussiate of potash, diluted with three times its bulk of gum water, so strong as just to flow freely without adhesion to the lip of the vessel. Care is required to spread this wash with one application, evenly, over every part of the paper. Beautiful pictures are thus produced, which will immediately bear exposure to Light tolerably well, but which after a few days will bear strong sunshine uninjured. By long keeping, details which were barely seen at first, come out with continually increasing intensity.

5. Wash a paper with a solution of the ammonia-citrate of iron and dry it; then wash it over with a solution of the ferrocyanate of potash; there is no immediate formation of true prussian blue, but the paper rapidly acquires a deep purple color. If in this state these papers are exposed to Light, they give positive pictures of great sharpness; but they possess this peculiarity—they darken again spontaneously on exposure to the air in darkness, and are soon obliterated. The paper, however, remains susceptible to Light, and capable of receiving other pictures, which fade in their turn. If these pictures are washed with ammonia or its carbonate, they are for a few moments obliterated, but they presently reappear, with *reversed lights and shades*. "In this state they are fixed, and the ammonia, with all that it will dissolve, being removed by washing in water, their color becomes a pure prussian blue, which deepens much by keeping. If the solutions be mixed, there results a very dark violet-colored ink, which may be kept uninjured in an opaque bottle, and will readily furnish by a single wash, at a moment's notice, the positive paper in question, which is most sensitive when wet."

6. Paper simply washed with the ferrosesquicyanuret of potassium, is highly sensitive to Light. Exposed to sunshine for about an hour, with an engraving upon it, a beautiful negative photograph is the result. These are fixed by soaking in water in which a little sulphate of soda is dissolved, to ensure the fixity of the prussian blue deposited. While dry this cyanotype is dove-color on a greenish yellow ground; after washing, it becomes bright blue on a white ground.

7. Prepare a paper by washing, first, with a weak solution of ammonia-citrate of

iron, one part by weight of the salt to twenty parts of water, and, when dry, with a saturated solution of the protonitrate of mercury. When nearly dry expose it for twenty minutes or half an hour to the Light, and a faint photograph will result. If it is now wetted with water and held for a few minutes in the sun, every part of the picture becomes visible, each line assuming an inky blackness. Instead of water, the solution of the nitrate of mercury may be used, and it possesses the advantage of giving greater permanence to the picture than when it was excited by water only.

The rationale of these processes has been well explained by their talented discoverer. In nearly all cases the action of the sun's rays is a deoxidising one. In the case of the ferrosesquicyanuret of potassium, No. 6., oxygen is parted with, which combines with hydrogen to form water. Prussian blue is deposited, the base being supplied by the destruction of one portion of the ferrocyanic acid, and the acid by the destruction of another. The change which takes place in the other cyanotype processes is somewhat more complicated.

To make this clear, however, I shall again quote from Sir John Herschel's Memoir :—

"It seems at first sight natural to refer these curious and complex changes to the instability of the cyanic compounds; and that this opinion is to a certain extent correct is proved by the photographic impressions received on papers, which have no iron but what exists in the ferrocyanic salts themselves. Nevertheless, the following experiments abundantly prove that in several of the changes above described, the *immediate action* of the solar rays is not exerted on these salts, but on the iron contained in the ferruginous solutions, added to them, which it deoxidises or otherwise alters, thereby presenting it to the ferrocyanic salts in such a form as to precipitate the acids in combination with the peroxide or protoxide of iron, as the case may be. To make this evident, all that is necessary is simply to *leave out the ferrocyanate* in the preparation of the paper, which thus becomes reduced to a simple washing over with the ammonia-citric solution. * * * If a slip of this paper be held for only four or five seconds in the sun (the effect of which is quite imperceptible to the eye), and when withdrawn into the shade be washed over with the ferrosesquicyanate of potash, a considerable deposit of prussian blue, takes place on the sunned part, and none whatever on the rest, so that on washing the whole with water, a pretty strong blue impression is left, demonstrating the reduction of iron in that portion of the paper to the state of protoxide. The effect in question is not, it should be observed, peculiar to the ammonia-citrate of iron. The ammonia and potasso-tartrate fully possess, and the perchloride, *exactly neutralised*, partakes of the same property: but the experiment is far more neatly made, and succeeds better, with the other salts."

I have found that nearly all the salts of iron, under the influence of the sun's rays, for a longer or shorter period, undergo the same kind of decomposition, and to a certain extent, exhibit the same phenomena when washed with the ferrocyanates.

Prismatic Analysis. — *(Herschel)* — Papers washed with the ferrosesquicyanuret of potassium exposed to the prismatic spectrum, prove that the decomposition of the salt, and deposit of prussian blue, is due to the action of the blue and violet rays, the rays below the blue, having absolutely no influence. The greatest activity appears to exist about the region of the indigo rays.

If this salt is mixed with perchloride of iron, and washed over paper, whilst it is exposed to the spectrum, the action is continued down to the very end of the thermic spectrum. The formation of the deposited color in this region is accompanied with phenomena of a novel character, referable to the heat developed by the thermic spectrum. Oval brown spots are formed, which correspond with the heat spots referred to, and which are evidently due to calorific agency. If ammonia-citrate of iron is used instead of the perchloride, "a copious and richly-colored deposit of Prussian blue is formed over the whole of the blue violet, and extra spectral rays in that direction, extending downward (with rapid graduation) almost to the yellow." If the action of Light is continued, the blue and violet rays in a very strange way destroy their own work: "a *white* oval makes its appearance in the most intense part of the

blue, which extends rapidly upwards and downwards. At a certain point of the action, the upper or more refrangible extremity of the white impression exhibits a semi-circular termination, beyond which is a distinct and tolerably well-defined *conjugate image*, or insulated circular white spot, whose centre is situated far beyond the extreme visible violet."

Sir John Herschel has also examined the action of the prismatic rays on the ordinary ferrocyanuret of potash, which it is well known undergoes a change slowly in the sunshine, depositing prussian blue. Paper washed with a fresh solution of this salt, slowly deposits when exposed to the spectrum, prussian blue over the region of the blue, violet, and lavendar rays, whilst the formation of a violet-colored streak takes place, where the violet ray is most intense. The action of the calorific rays is very strongly marked; when the decomposition of the salt is assisted by a wash of very dilute sulphuric acid. The impression is at first greenish, but as it blends with the upper portions of the spectrum, it passes into blue; the ground upon which this *streak* is impressed being a brown, which appears to form, as it were, a narrow border around it.

We are indebted to Sir John Herschel also, for a very remarkable process, in which the dormant pictures are developed by the breath or a damp atmosphere. This process was announced at the Cork Meeting of the British Association in August, 1843, and was published immediately in the *Atheœnum* of September the 16th, from which publication the particulars of the process are extracted.

If nitrate of silver, specific gravity 1.200, be added to ferro-tartaric acid, specific gravity 1.023, a precipitate falls, which is in a great measure re-dissolved by a gentle heat, leaving a black sediment, which being cleared by subsidence, a liquid of a pale yellow color is obtained, in which a further addition of the nitrate causes no turbidness. When the total quantity of the nitrated solution added amounts to about half the bulk of the ferro-tartaric acid, it is enough. The liquid so prepared does not alter by keeping in the dark. Spread on paper and exposed *wet* to sunshine (partly shaded) for a few seconds, no impression seems to have been made, but by degrees, although withdrawn from the light, it developes itself spontaneously, and at length becomes very intense. But if the paper be thoroughly dried in the dark (in which state it is of a very pale greenish yellow color), it possesses the singular property, of receiving a dormant or invisible picture, to produce which (if it be, for instance, an engraving that is to be copied), from thirty seconds to a minute's exposure in the sunshine is requisite. It should not be continued too long, as not only is the ultimate effect less striking, but a picture begins to be *visibly* produced, which darkens spontaneously after it is withdrawn. But if the exposure be discontinued before this effect comes on, an invisible impression is the result, to develope which, all that is necessary is to breathe upon it, when it immediately appears, and very speedily acquires an extraordinary intensity and sharpness, as if by magic. Instead of the breath, it may be subjected to the regulated action of aqueous vapor, by laying it in a blotting-paper book, of which some of the outer leaves on both sides have been damped, or by holding it over warm water. Sir John Herschel remarks, that many preparations of gold and silver possess a similar property in an inferior degree.

So extensive have been the researches of the distinguished philosopher, whose labors I have so frequently quoted, particularly into the action of the sun's rays on the salts of iron, that little can be added to his published information. It may not, however, be uninteresting to add a few brief remarks on some of the salts of iron, to which Sir John Herschel has not extended his observations, or at least which have not been recommended by him as photographic agents. Oxalate of iron in solution, to which an excess of oxalic acid has been added, affords, after a few minutes' exposure, when washed with nitrate of silver, a very intense black picture, which slowly fades into a dingy grey. If the oxalate of iron and silver be combined in the paper, and exposed, so powerful a picture results, that it is difficult to tell the right from the wrong side, the impression penetrating quite through the paper.

Oxalate of iron, with an excess of acid, washed over paper, and then a wash of ferrocyanate of potash, gives a very faint blue paper, which blue color is entirely dis-

charged if the acid is in large excess; if, however, the proportions are so adjusted that a little blue is still left on the paper, it is exceedingly sensitive to the sun's rays, the color being very rapidly discharged. If after exposure, the paper is washed over with nitrate of silver, chloride of mercury, or a neutral solution of gold, a blue picture of much intensity results, which may be rendered tolerably permanent either by a wash of the ferrocyanate itself, or by a solution of the iodide of potassium.

Iodide of iron loses color in the sunshine, and on paper, gives a positive picture; the subsequent application of the nitrate of silver has not been, with me, in any way successful in improving the faint picture it gives.

Chromate of iron changes but very slightly in color by exposure; but if spread on glass or paper, and exposed, one part being shaded, and afterwards it is washed over with the nitrate of silver, the chromate of silver is formed over one portion, but not over the other. It is necessary that the chromate of iron should be newly formed.

As far as my researches have gone, all the persalts of iron are converted into protosalts by exposure to sunshine, when in combination with organic matter. And I have reasons for believing that all the protosalts undergo some change, it being very evident that exposed and unexposed portions of papers washed with solutions of the protosalts act very differently upon solutions of gold and silver. What this change may be it is impossible to say in the present stage of our inquiry, but it will be seen that scarcely any of the metallic salts resist the agency of the sun's rays, as will be still further proved. The absorption of oxygen, or deoxidation, will not account for many of the results which we obtain.

CHAPTER VI.

Copper.

It has been long known to me that plates of copper could be rendered sensitive to solar influence, by being submitted to iodine vapor. In a very early stage of my experiments with the Daguerreotype, I operated with pure copper plates; and some results obtained at that time were of considerable promise. The publication of any accout of a process, by which photographs might be taken upon copper, was first made by Mr. Fox Talbot, who has included it amongst those embraced by his patent for "improvements in obtaining pictures or representations of objects by the action of Light." Mr. Talbot's process is as follows:—A polished copper plate is exposed to the vapor of iodine or bromine, or the two substances combined, or either of them in combination with chlorine. Or the copper plate may be immersed in a solution made by dissolving one of the abovementioned substances in alcohol or some other solvent. The plate is now placed in the camera, and after it has remained in it for a period varying, according to my own experiments, from twenty minutes to two hours, it is exposed to sulphuretted hydrogen, or one of the liquid hydrosulphurets. By these, various colors are produced upon the plate, according to the intensity with which Light has acted on the different parts.*

It must not be imagined, that the colors produced on the plate of copper are the natural colors of the object delineated. This coloration arises, merely from the formation of films, of greater or less thickness, of sulphuret upon those parts of the iodu-ret of copper, which have been decomposed by the sun's influence.

The Chromatype.—The first annoucement of this process, was made by the author, at the meeting of the British Association, August, 1843. The process is so exceedingly simple, and the resulting pictures of so very pleasing a character, that, although it is not sufficiently sensitive for use in the camera obscura, it will be found of the greatest value for copying botanical specimens, engravings, or the like.

Good writing paper is washed over with sulphate of copper in solution, the strength of which is not of much importance. About one drachm to an ounce of water is preferred; when dry it is washed over with a moderately strong, but not a saturated, solution of the bichromate of potash. The paper, when dry, is fit for use, and it may be, I believe, kept for any length of time in a portfolio, without its sensibility being in the least impaired.

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* See Repertory of Patent Inventions, October, 1841.

When exposed to the sunshine, the first change is to a dull brown; and if checked in this stage of the process, we have a *negative* picture; but if the action of Light is continued, the browning gives way, and we have a *positive* yellow picture on a white ground. In either case, if the paper, when removed from the sunshine, is washed over with a solution of nitrate of silver, a very beautiful positive picture results. In practice it will be found advantageous to allow the bleaching action to go on to some extent; the picture resulting from this, will be clearer and more defined, than that which is procured when the action is checked at the brown stage. To fix these pictures, it is necessary to remove the excess of nitrate of silver, which is done by washing in pure water. If the water contains any muriates, the picture suffers; and long soaking in such water entirely destroys it: or if a few grains of common salt are added to the water, the apparent destruction is very rapid. The picture is, however, capable of restoration; all that is necessary being to expose it to the sunshine for ten minutes or a quarter of an hour, when it revives; but instead of being of a red color, it becomes lilac, the shades of color depending upon the quantity of salt used to decompose the chromate of silver. After this exposure, no fixing is required, the continued action of light only still further improving the pictures.

Sir John Herschel has given some instances in which the chemical rays, as they are called, appear to destroy their own work. I am enabled to add another to the list. If a piece of the chromatype paper is exposed to the prismatic spectrum, it darkens instantly over the region of the blue ray. This darkening extends to a point beyond the violet ray equal to the width of that ray, and downwards to the extreme edge of the green, proceeding, by long exposure, into the yellow. After a short time, this darkening is followed by a bleaching action, which commences at the upper edge of the violet, and proceeds slowly downwards to the edge of the most refrangible green. The brown over the green space gives way but very slowly; and it is only after very long-continued exposure to a good sun, that this portion is entirely whitened.

If we mix together a solution of sulphate of copper and of the bichromate of potash, the mixture will, in the dark, remain perfectly clear for a considerable time; but if exposed to sunshine, in a few minutes a rapid effervescence ensues, and a greenish yellow precipitate falls. This, and the precipitate produced in like manner in neutralised platina solutions, deserves the attention of chemists.

Modification of the Chromatype.—If to a solution of the sulphate of copper we add a solution of the chromate of potash—the neutral salt—a brown precipitate falls very copiously, which is a true chromate of copper. If this precipitate, after being well washed, is added to water rendered tolerably acid by sulphuric acid, it is dissolved, and a dichromatic solution is formed, which is, when spread upon paper, of a pure yellow. A very short exposure of the papers, washed with this solution, is quite sufficient to discharge all the yellow from the paper, and give to it a perfect whiteness. If an engraving is to be copied, we proceed in the usual manner; and we may either bring out the picture by placing the paper in a solution of carbonate of soda or potash, by which all the shadows are represented by the chromate of copper; or by washing the paper with the nitrate of silver. It may sometimes happen that, owing to deficient Light, the engraving is darkened all over when the silver is applied; this color, by keeping, is gradually removed, and the Lights come out clear and sharp. The little excess of acid in the paper, acts upon the chromate, which has been partially changed, and a pale yellow, instead of a red salt, is formed.

If the chromate of copper is dissolved in ammonia, a beautiful green solution results. If papers are prepared with this solution, they act similarly to those last mentioned. If the pictures prepared as above, are washed with ammonia, they are nearly obliterated; but upon exposing them to the air and Light, negative pictures of a pale blue color result.

Iodide of copper, by long exposure, does not appear to undergo any change; if, however, it is washed over with nitrate of silver, it becomes unequally black upon the exposed and covered parts. If, previously to exposure, freshly made iodide of copper is washed over with nitrate of silver, an intense black paper results. This paper has some remarkable properties; if it is

exposed wet to the prismatic spectrum, a bleaching action comes on with rapidity under the red and orange rays, particularly over the space occupied by the "parathermic" rays of Herschel. Little or no action is seen to take place over any other part; but upon removing the paper from the Light, and washing it with hyposulphite of soda, it becomes evident that a deep browning, penetrating quite through the paper has been effected by the blue rays.

If we place leaves of tolerable transparency upon such a paper, the bleaching action is carried on beneath them, whilst the exposed parts remain of a jet black color.

All the salts of copper, undergo some change under the influence of the solar radiations. The change is not in many cases apparent, but in some it is so. If, however, a solution of any salt of copper is laid over paper, and it be exposed to the sunshine, a change is brought about; and if after it is removed from the Light, it is washed with nitrate of silver, the covered portion remains of its original color, whilst the exposed parts darken very considerably. The following salts afford really interesting pictures:—Sulphate, muriate, nitrate, carbonate, acetate, oxalate, ammonia-oxalate, nitrate, malate, chloride, bromide, and arseniate. I do not doubt but by attention and experiment, some of these may afford very valuable photographic preparations. At all events these results, to which I was the first to call attention, show the immense field of inquiry which is opening before us.

CHAPTER VII.

Manganese.

The instability of some of the salts of manganese, led to the hope that this metal might be made available for photographic processes. Although this has not yet been effected, a sufficient amount of evidence of its compounds being, like those of other metals, susceptible of change under solar influence, has been obtained.

If two bottles are filled with a solution of mineral chamelion, (manganesiate of potash), and one of them be placed in the sunshine, whilst the other is carefully preserved in darkness, it will be found that the one exposed to the sun, will very rapidly throw down a deep brown precipitate, whereas the one in the dark, remains for sometime quite clear. This experiment, if carefully made in weak diffused day-light, will exhibit, although more slowly the same change showing in avery remarkable manner the influence of Light in determining the tendency to precipitation.

If a solution of the manganesiate of potash is washed over paper, it imparts to it a brown color. The sun's rays have a tendency to discharge this color, and thus give a positive image. The addition of a small quantity of the nitrate of silver to paper prepared with this salt of manganese, renders it brown, but upon exposure to Light it assumes a very intense blackness.

If the deutoxide of manganese is dissolved in a solution of the cyanuret of potassium, and paper washed with this solution, it will be found that an exposure to sunshine for half an hour, will produce no visible change over the surface; but on looking through the paper, it becomes evident that a considerable deposition of a brown precipitate has taken place within its pores over the spaces which were not protected from the action of the Light.

Many of the salts of manganese spread upon paper, exhibit some evidence of change under solar action. The muriate in particular undergoes decomposition, and some oxide of manganese is deposited. It is, however, to be remarked, that in those cases in which no apparent change is produced even by prolonged exposure to the sun's rays — that is, no change of color — we are not to conclude that no disturbance has taken place. In nearly all cases, it will be found that a sufficient amount of change has been effected, to be rendered evident by the application of some reagent, after it is removed from the Light. In particular, in the instances of the manganesic salts, as in those of copper, the subsequent application of the nitrate of silver produces very decided evidences of change. The chloride of gold in some cases, appears to be reduced by these salts which have undergone solarization, in a manner strikingly different from the effect produced by salts which have not been exposed to the sun. It has also been noticed, that the balance of affinity has been so much disturbed by the solar agency, that ammonia, the hydrosulphurets, and the ferroprussiates

produce different effects upon the exposed and covered parts. May not these very curious phenomena be dependent upon the absorption of the active principle which is found to exist in the sun's rays, and every radiant source?

CHAPTER VIII.

Lead.

The pure colored oxide of lead, in a moist state, under the influence of the sun's rays, parts with oxygen, and is converted into the deutoxide. It has been found, that this is more decidedly the case, with the oxide prepared by chlorine from the acetate of lead, than with that which is prepared by the action of nitric acid on minium or red lead; from which it would appear that the oxygen is in looser combination in the one case than in the other. It was observed by Sir H. Davy, that this change was effected by the least refrangible rays; hence we may suppose it to depend on the calorific power of these rays.

In a very early stage of his photographic inquiries, Sir John Herschel was led to employ mordant washes of lead, and of organic matter precipitated by lead. These were found to have a very decided effect, in quickening the change which takes place upon the nitrate of silver when exposed to Light, and in some cases it was found that a sensibility quite equal to the processes proposed by Mr. Talbot was produced.—Papers, unfortunately, which are prepared with lead, have a tendency to darken spontaneously, or at least to turn very yellow, or sometimes grey, in the dark.

Combinations of lead, with the organic acids, have been repeatedly tried; but, except in a few instances, no very marked effect has resulted. Oxalate of lead does indeed appear to be susceptible of change of color under prolonged exposure; and the formozate and benzoate of lead, show that the solar rays produce some effect with tolerable quickness, which is rendered evident by subsequent washing with gallic acid, with nitrate of silver, or one of the hydrosulphurets.

If red lead is boiled with cyanuret of potash, and paper washed with this solution is exposed to the Light, it undergoes some change, which is rendered evident by nitrate of silver. If gallic acid is washed over paper saturated with this solution, it becomes, at first pink, and then brown. Upon exposing this to the Light, it loses color; but although this change is produced with some rapidity, it is not found to proceed on to the point of whiteness, however long the paper may be exposed to sunshine.

If acetate of lead is washed over a paper and then a weak solution of gallic acid, it will be found that no change of color is produced for some time in perfect darkness; but a very short exposure to Light brings on a very decided darkening, which goes on even without the continuance of the solar influence.

Numerous combinations of lead and other metals have been examined, with a view to detect, if possible, some of those cases of unstable affinity which yield the most interesting photographic results. Nothing very remarkable has been discovered. Lead certainly has the power of increasing the sensibility of gold and platinum to the action of Light, and of carrying on the degree of darkness ultimately produced, much further than when these metals are used alone; and hence it is very probable that lead may in some processes be of considerable use, where the object is to produce originals, from which a great number of transfers may be taken.

CHAPTER IX.

Nickel.

Nitrate of Nickel spread upon paper passes with some degree of rapidity, into a fine light brown, giving tolerably good negative pictures.

Nitrate of nickel spread upon paper, and then ammonia, promises to afford some very interesting photographic results. It is somewhat difficult to decide upon the exact proportion in which the ammonia should be used. It appears that a sufficient quantity should be applied to effect the precipitation of the oxide of nickel, but not enough to re-dissolve it. If an excess of ammonia is used, the paper appears absolutely insensible, but if the proportions are well adjusted, a preparation which darkens quite as readily as the nitrate of silver results. The subsequent application of the nitrate of silver, considerably darkens the

parts which have been already changed by Light.

Upon submitting paper thus prepared to the prismatic spectrum, it was found that the change was entirely dependent upon the influence of the rays of greatest refrangibility, the prolonged action of the other rays producing no apparent effect.

Iodide of nickel, prepared with nitrate of nickle and iodide of potassium, changes with some degree of quickness; but if the iodide of ammonia is used, no change takes place.

Nitrate of nickel and ferroprussiate of potash changes, after an exposure to sunshine of from fifteen minutes to half an hour, from a delicate light blue to a pea green.

Many other salts of this metal have been found to afford similar results.

CHAPTER X.

Sundry Metallic Compounds.

Tin.—It has been found that chloride of tin, carefully neutralised, will, when in contact with any organic matter, undergo a considerable change in the sunshine; a dirty appearance being given to it in half an hour, so as to contrast very decidedly with the original whiteness. Its oxide, washed, after exposure to the sun, with nitrate of silver or chloride of gold, exhibits very decided evidences of change.

The purple of cassius changes in the sunshine to a steel grey. If the dyers' muriate of tin is applied to paper, and then dried without much heat, it may be used to produce results of some interest. If, after exposure for half an hour to good sunshine, the paper is washed with very dilute chloride of gold, the purple of cassius will be formed with much greater readiness over the shaded than the exposed parts, giving thus positive images If the solution of gold is applied too copiously, the darkening is carried on with great rapidity over the whole of the sheet; but although at first it appears that the sheet is of one uniform color, it will, by keeping, show distinctly the covered spaces.

Cobalt.—The changes which some of the salts of this metal undergo when exposed to heat are well known. These appear to depend entirely upon the abstraction of moisture. Under the influence of the prismatic spectrum, these changes of color take place, but only under the red rays, by long exposure. Another kind of change is apparent under the spaces on which the blue rays fall, and which, very different from that produced by the heat rays, is a permanent change. On paper the nitrate, muriate, and carbonates of cobalt, have been found to deepen in color very considerably under exposure. In a few instances, when the sun has been very fervent, the pale blue of these salts changed to a good violet; but when removed from the light, this color passes into a deeper blue. Washed with nitrate of silver, the blue passes into a brown; and if again exposed, positive images are produced.

The very intense and beautiful brown which is given to the ordinary argentine preparations, by the presence of cobalt, may possibly be of some advantage in practice. If paper is washed with muriate of cobalt and then nitrate of silver, in proper proportions to allow the silver to be in excess, it will be found to be superior to the ordinary muriated papers; and it is so far economical, that a very much weaker solution of the nitrate of silver may be used, and as deeply colored an impression made, as when a larger dose of the silver has been applied. Nitrate of silver does not darken very readily when spread on paper; but if mixed with nitrate of cobalt, it will be found to change more easily, and give a deeper color than the silver salt alone would do.

Some of the arsenical combinations will be found to be influenced by the solar rays, and particularly the arseniate of potash. If a paper washed with this salt is exposed for an hour or two, the subsequent application of nitrate of silver brings out a decided image of any body used to obstruct the Light.

Tartrate of antimony is also found to be affected by the agent we are considering, and pictures may be produced by washing it with the nitrate of silver, as in other instances.

Bismuth, Cadmium, Rhodium, and some other metals, have been found, under certain conditions, to afford evidence of the same kind of changes as we have seen takes places in so many other bodies. The attentive study of the peculiarities of the rarer metallic compounds will, it appears, probably afford many curious results. As

far as the researches have been carried they afford good presumptive evidence that every chemical combination undergoes some peculiar modification under the power of the solar rays.

CHAPTER XI.

Chromium aad Ferrocyanogen.

The Bichromate of potash is particularly distinguished by its photographic properties. These were first pointed out by Mr. Mungo Ponton, who proposed the following interesting process :—Well-sized paper is to be immersed in a solution of bichromate of potash, and dried by the fire ; by this it assumes a fine yellow color, and it may be kept for any length of time without injury, and is always ready for use. When an engraving is laid on this paper, and it is exposed to the sunshine, it passes rapidly, over all the parts through which the Light can act, into a light brown ; consequently the first result is a yellow picture upon a brown ground. In this state the photograph cannot be exposed to the Light, as all the yellow parts would become brown. If, however, the paper is soaked in water, all the unchanged salt is dissolved out, but that which is browned is not disturbed. We have thus a delicate negative picture, from which positive copies may be taken. If the paper is exposed too long to sunshine, it loses color. A pleasing variety may be made by mixing sulphate of indigo, with the bichromate of potash, the color of the object and of the ground being different shades of green.

The change which the solar rays produce upon this salt is one of deoxidation. Chromic acid is liberated, and it combines with the organic matter of the size of the paper. Mr. Ponton states that the neutral chromate exhibits no such change ; it has, however, been since discovered, that even the chromate of potash on paper will darken ; but it is only by long exposure that much effect can be produced ; and the ultimate degree of darkness falls very far short of that given by the bichromate. This change is effected by the blue rays of the spectrum, and their action appears to be confined within rather narrow limits.

M. E. Becquerel has investigated, with considerable care, the action of chromic acid on organic bodies under the influence of Light ; and he has shown that the darkening is dependent upon the nature of the size used on the paper. Perceiving this, it occurred to him that the application of starch as a size to the paper, pleasing effects might be produced, by the agency of iodine, and the result was satisfactory.

According to Becquerel's method, a sizing of starch is applied very evenly over the paper ; it is then steeped in a concentrated solution of the bichromate of potash, and dried. Pictures are taken in the usual way, and the paper is washed and dried. When dry, it is immersed in a weak alcoholic solution of iodine, and afterwards, when it has remained in it for some time, it is rinsed in water, and carefully dried between folds of blotting paper. If the drawing is not considered to be sufficiently distinct, the immersion may be repeated, until it becomes so. The effect is not improved by using a more concentrated solution of iodine. When the paper is wet, the shades of the picture are of a very fine blue, but when it is dry, they become of a deep violet. If while the photograph is still wet, it be covered with a layer of gum arabic, the color of the drawing is greatly preserved, and it is more beautiful when dry.

The metallic chromates have been thought to be compounds of too permanent a character to change under solar influence. Many of them, however, it wlll be found deepen in color by exposure; and the chromate of mercury has been found to undergo a very remarkable change. Paper was prepared with the bichloride of mercury (corrosive sublimate) and the chromate of potash, and exposed with an engraving upon it for some hours. There was evidently some change of color, but it was very slight over the exposed parts. This was placed aside, and remained in a dark drawer for two or three months without being noticed. It was then found to have become through its substance semi-metallic, and both on the front and back of the paper, a tolerably good impression of the engraving was visible.*

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* Whilst these pages have been going through the press, the author has discovered a very beautiful variation of the chromatype. A neutral solution of the chloride of gold is mixed with an equal quantity of the bichromate of potash. Paper is washed with this solution, and dried near the

Ferrocyanates.—The photographic uses of these salts have already been the subject of consideration; and it only remains to state, in this place, that a solution of the ferroprussiate of potash mixed with a solution of the iodide of potassium, applied to paper, speedily changes in the sunshine, and may be used for the production of a very pretty variety of negative photographs. M. Fischer pointed out that a solution of ferrocyanate of potash precipitated by alcohol, and rapidly dissolved in water, when exposed to Light passes into a green and then a blue color, depositing prussian blue, and giving a strong smell of hydrocyanic acid.

fire. On exposing this paper to light, it speedily changes, first to a deep brown, and ultimately to bluish black. If an engraving is superposed, we have a negative copy, blue or brown, upon a yellow ground. If this photograph is placed in clean water, and allowed to remain in it for some hours, very singular changes takes place. The yellow salt is all dissolved out, and those parts of the paper left beautifully white. All the dark portions of the paper become more decided in their character, and accordingly as the solarisation has been prolonged, or otherwise, or the light has been more or less intense, we have crimson, blue, brown, or deep black negative photographs of a most beautiful character.

ON TAKING DAGUERREOTYPES IN THE NATURAL COLORS.

BY THE EDITOR.

The announcement—which it will be borne in mind was *first* made in the January number of the *Photographic Art Journal*, and which called forth the *first* published letter of the discoverer in the February number—of Mr. L. L. Hill's discovery of obtaining impressions on Daguerreotype plates in the natural colors having attracted among Daguerreotypists that attention which it so justly deserves, we would offer some remarks and speculations on the subject, and state some facts, which though they may not be entirely new to all, may never have entered the minds of the majority.

Taking daguerreotypes in color is no new theme. It has occupied the attention of all the European philosophers ever since the discovery of photogenic drawing and no experiment has been left untried by Daguerre, Arago, Becquerel, Moser, Talbot, Hunt, Claudet, Lerebours, Niepce, Sir John Herschel of Europe, and Professor Page, and we believe, Professor Draper, of our own country, to produce this greatly to be desired result. So intense has been the public mind on this subject in Europe—particularly in France—that the French government offered, last year, a premium of six thousand francs for its discovery. The time allowed, however, (10th January 1851,) for putting in the claims was undoubtedly too short for any successful results from any experiments which may have been made, for we have learned nothing farther as yet in regard to the matter.

The fact that accident has frequently produced certain colors upon the plate, has convinced every one at all conversant with chemical changes, of the more than probability that the whole range of prismatic colors might also be impressed, and there is not now one among the most celebrated chemists and philosophers of Europe who do not firmly believe in its practicability, although many have relinquished the idea of effecting it by experiment, asserting, that, notwithstanding their faith in one day beholding a naturally colored Daguerreotype, the result will be the effect of mere accident.

In order to reproduce the colored image of the spectrum upon the Daguerreotype plate it is necessary to form a chemical compound, each of the ingredients of which shall have a greater affinity for one particular color than another, and this com-

pound must possess the quality of either bringing out the picture, or of becoming the sensitive coating of the plate. If the latter, then a second chemical must be obtained in place of mercury, which will bring out the picture without destroying the colors.

Now, as various experiments have been made with this view, it may be interesting to our readers to note them in the course of this article, in order to show the precise relation in which science stood in regard to the matter up to the time of Mr. Hill's successful labors. Mr. Arago says:

"It has been a subject of anxious inquiry whether, after, having obtained by Daguerreotype the most admirable gradations of light and shade, it will not be possible to obtain by it the reproduction of colors; to substitute, in a word, *paintings* in lieu of the sort of *aqua tinta* engravings which are now produced.

"This problem will be solved only when an elementary substance shall be discovered, which the red rays will color red; the yellow rays, yellow; the blue rays, blue, &c. Mr. Niepce had already discovered effects of this nature, in which, in my opinion, the phenomenon of the colored rings performed a certain part. Perhaps it was the same, in respect to the red and violet, which Sybeck obtained on the chloride of silver, at the two ends of the solar spectrum. Mr. Suetelet, has just communicated to me a letter, in which Sir John Herschel announces that his sensitive paper, having been exposed to a very vivid solar spectrum, afterwards showed all the prismatic colors, excepting the red. In presence of these facts it would certaintly be rash to affirm that the natural color of objects will not one day be reproduced in photogenic images.

"Mr. Daguerre, in the course of his first experiments on phosphorescence, discovered a powder which emitted a red glimmer after the red light had acted upon it; another powder, to which the blue rays imparted a blue phosphorescence; a third powder, which assumed a luminous green color by the action of the green light; he mixed these powders mechanically together, and thus obtained a compound which became red under the influence of the red rays, green with the green rays, and blue in the blue rays."

Thus we see the possibility of forming a compound, the chemical ingredients of which—as we said before—may each be acted upon by the colored rays only for which it has the greatest affinity, and reflecting the remaining colored ray. In the progress of Mr. Hunt's Treatise on Light, which we are publishing in the Art-Journal, it will be seen, that the various substances on which he has experimented in relation to their photogenic properties, different colors and shades of colors are produced by the action of light upon them. Before we close this article we shall give a list of substances and the colors to which they are changed by the action of light.

It is well known that the colors of all bodies depend entirely upon their molecular arrangement, so that in forming a compound for the purpose of preserving the natural colors of the spectrum upon the daguerreotype plate it would be necessary to observe this law of nature, and taking into consideration the many chemical agents that present themselves to the experimentalist, it is not surprising that this compound has not heretofore been discovered; in fact, Mr. Hill's discovery proves how truly M. Lerebours spoke when he asserted, after experimenting for a long time to effect the result—that if discovered at all it would be accidental.

Mr Hunt found, that by preparing a paper with muriate of barytes and nitrate of silver, and allowing it to darken while wet, in the sunshine to a chocolate color, and afterwards exposing it to diffused light under a frame containing a red, a yellow, a green and a blue glass for one week, that it became red under the red glass, a dirty yellow under the yellow glass, a dark green, under the green, and a light olive under the blue.

In another experiment he submitted a paper prepared with bromide of silver and gallic acid, to the action of light in a camera embracing a view of a clear blue sky, stucco fronted houses, and a green field. The picture produced was very beautiful, and "when held between the light and the eye exhibited a curious order of colors. The sky was of a crimson hue, the houses of a slaty blue, and the green fields of a brick red tint."

In the second edition of our "*Art of P... graphy*" we gave the following ex-

periment, which, although unimportant in itself, we hoped would ultimately lead to some good result.

"A daguerreotype plate is connected with one pole of a galvanic battery; a piece of platina foil being connected by a copper wire likewise, with the other pole. A solution of muriatic acid in water being prepared—about one part acid to two of water—the plate and platina are plunged into it, and brought near each other, but not in contact. The circuit, of course, being made up through the acid solution, a chemical action is established over the silver surface of the plate; the chlorine of the decomposed muriatic acid attacking the silver and forming chloride of silver over the surface. As the film of chloride of silver is produced, and gradually thickens, it passes through the colors of Newton's thin plates, and at length assumes a lilac, which is the sensitive coating. These plates have not been rendered sufficiently sensitive to ensure any action, except from the direct rays of the sun. But if a prismatic spectrum, of a well defined character, is allowed to fall upon the prepared plate, it will be found, after an exposure of a few minutes, that a distinct impression of the seven colored rays are obtained in *color*, every ray being represented by its own color on the plate, the red being the most intense, and the yellow the least so."

We have instituted several experiments, the results of which are not of sufficient importance to publish, but we would recommend a trial of the following, although we cannot promise any successful result. We were on the point of trying it three months ago, but a pressure of other business prevented, and we now submit it to the Daguerrean public as a suggestion to any experiments which may be made—for we have no doubt there are not a few:

After coating the plate to a blue tint with the galvanic battery as described above, expose it to the fumes of the following compound—the exact proportions of which must be ascertained—if at all—by experiment. We give such as we conceive to be the right.

Take a saturated solution of sulphate of copper—say, one ounce—to this add one-quarter of an ounce of cyanide of potassium dissolved in one ounce of chloro-chromic acid. We can give no precise tint for this coating, for producing the picture; it must be determined by the experimentalist.

To bring out the picture try chromate of mercury: or chromate of mercury and ammonia.

Probably a little iodate of ammonia added to the above compound may be of service. We should try the ingredients enumerated in various proportions and under every circumstance before we relinquished them altogether.

Coating the plate in the usual way over iodine and bromine, and bringing out the picture with phosphate of ammonia, or ammonia phosphate of mercury may bring out the latent colored image. From M. Daguerre's experiments, already referred to, we believe some compound having phosphorus for its base, and ammonia for its solvent, must enter into the process for producing colored pictures.

The fact that silver is changed by the action of various chemicals, to different colors, must convince every one of the possibility of forming some compound by which all may be impressed upon the daguerreotype plate; and the fact that a compound has been formed by which three decided and distinct colored rays have been made to impress themselves upon the space upon which they fell separately decides the matter—in our own mind—most conclusively.

Now, let us look a little into the philosophy of the coloring properties of light, as we view its effects on the flowers of the fields, the trees of the forest, the mineral productions of the earth, and on the animal kingdom. This study has occupied the attention of all the most profound philosophers who have lived during the last two centuries, and they have been enabled by the minuteness of their researches and observations to establish the following facts:

Light, besides its chemical and heating properties, is composed of seven different colors, each of which may be imparted to any object upon which it falls according to the affinity existing between that object and the other colored rays; and this is the cause of the variety of colors which meet the eye as reflected from surrounding objects.

Let us take for example the red rose—the seven prismatic rays fall upon its petals, the orange, yellow, green, blue, indigo,

and violet, are all entirely absorbed by them, and the red alone is not, but is reflected, or thrown off, and consequently is the only color visible. The great variety of shades in the colors of roses is in like manner produced, but with this difference, that the colorific rays producing the particular color are more or less partially absorbed. Thus in a deep red rose the red rays are thrown off in all their intensity, while in a pink rose, a portion of the red rays is absorbed. Variegated flowers are the effect of the peculiar nature of the petal in reflecting more than one colored ray, and portions of several.

If the colorific rays are *all* absorbed by the object upon which they fall it becomes entirely black; and if none are absorbed, but all are reflected, the object is white, or colorless.

The absorbent powers of matter for the various colored rays being the effect of molecular arrangement and chemical constitution we can well understand why nature presents to the eye such a profusion of colors, with their various gradations of tints, as readily as we can the numerous forms, and chemical properties of bodies.

The knowledge of these facts enables us to produce every variety of color at will; thus by putting a few drops of sulphuric acid into a solution of chloride of calcium, a white solid will be formed.

A mixture of prussiate of potassa and sulphate of iron gives us a fine indigo color.

A solution of persulphate of iron, added to a tincture of galls, makes a fine black.

Two or three drops of sulphuric acid put into an infusion of purple cabage, produces a beautiful red.

Nitrate of mercury and infusion of galls, gives an orange color.

Nitrate of lead and hydriodic acid, forms a yellow.

A vegetable infusion and an alkali, gives a green.

And sulphate of copper, with equæ ammonia, produces a blue.

The great bar to the perfect accomplishment of procuring daguerreotype pictures in the natural colors, is the established fact that all colors are not equally photogenic; the several rays producing the same effect in different spaces of time; the most brilliant, such as red and yellow, being the slowest in their operation, while the more dense, as blue, violet, &c., act very rapidly.

The consequence resulting from this unequal action is, that you must solarise one portion of your picture in order to obtain a perfect coloration of the other, or you must sacrifice a portion of the colors.

This difficulty we have no doubt will be overcome by some modification of the process.

This appears to be the great difficulty under which Mr. Hill labors at present—although he has reduced it to a very small compass—and which prevents him from making any positive arrangements for making his discovery either privately or publicly known. We wish him a speedy deliverance from this one source of vexation.

Amalgam of Sodium for the Constant Battery.—M. Henrici prepared amalgam of sodium by plunging that metal into mercury, by which he formed a hard coherent mass. He substituted it for the zinc in a Daniel's arrangement; and compared the action with that of an ordinary constant combination. He says, "the action is so violent on the amalgam, that it lasts a very short time and is very irregular." The electro-motive force of such a combitation is greatly superior to that in which amalgam of zinc is used.—*Archives de Electricite*, No. 10, Sept. 31, 1843. Davy's experiment on amalgams of the alkaline metals, as the positive elements of one-fluid batteries, will be found in the Philosophical Transactions for 1826, p. 408.

A TREATISE ON PHOTOGRAPHY;

Containing the latest Discoveries and Improvements appertaining to the Daguerreotype.

BY N. P. LEREBOURS, *Optician to the Observatory, Paris, etc., etc.*

TRANSLATED BY J. EGERTON;

WITH A PREFACE, NOTES AND ALTERATIONS, BY H. H. SNELLING.

CHAPTER XI.

Of the Portrait.

WHEN Mr. Daguerre's admirable discovery was made known to the public, the higher classes of society in all countries hailed it with delight; but artists were divided in opinion concerning it. Some saw nothing in the first attempts that were made in the application of the art, but a cold and stiff copy of nature; and, as far as art was concerned, entirely devoid of interest: Others admired, in the first place, the perfection in the representation of the more prominent objects in the picture, joined to an almost miraculous precision in the details; then that admirable gradation of shade which makes each photographic image a masterpiece, we will not say of art, but of nature. But, one important idea then took possession of the minds of those who directed their attention to the art—Would it ever be possible to obtain portraits by the daguerreotype? The answer to that question was evidently dependent on the solution of this other one: Would it ever be possible to operate quickly enough to obtain, in the shade, during a very short interval, the physiognomy of the person whose likeness was to be taken? We candidly admit that the portraits which were made then, and for a very long time after, gave but little hopes of success even to the most impassioned admirers of the art. The method then followed required that a person should sit for twenty-five minutes, exposed in a glaring sunshine, with his eyes wide open. Some few adepts had the fortitude to endure this; but it will be easily understood that it was all to no purpose. Instead of portraits, the image produced had a corpse-like appearance.

Three years ago we constructed a daguerreotype apparatus adapted for portraits.* By having new curves, and by a considerable shortening of the focus, this apparatus operated in the shade in two minutes. This was, it will be admitted, an immense progress; but from thence to an instantaneous reproduction of the image there was an incalculable distance. Soon after, the application of the chloride of iodine by Mr. Claudet gave a new impulse to photography. In accordance with the inventor's wish, we hastened to make his process public, through the medium of the Academy of Sciences; from that time, the hope of reproducing the human countenance could be reasonably entertained. By this process some very fine impressions were then produced, and some magnificent portraits were taken, which were perfect likenesses, and in which only one thing was wanting—expression! Notwithstanding, numerous establishments for taking likenesses were formed; in all large towns the daguerreotype was used for producing portraits; and, what will doubtless surprise many persons, the only two establishments of this kind in London several times realised as much as £60 in one day.

However, the future prospects of the daguerreotype, as applied to the portrait, had like to have been brought to an end by the cadaverous-looking specimens, which were everywhere exhibited. The very idea of a portrait by the daguerreotype, excited a repulsive feeling. And even now, we every day find persons who are quite astonished when they see our specimens, so great is the contrast between them. The reason is obvious: for a fine impression, produced rapidly with a good object-glass,

* "As soon as the defective construction of the first apparatus for the reproduction of portraits had been once discovered, a remedy was found in the adoption of object-glasses of a very shortened focus. Messrs. Lerebours and Buron appear to have been the first to think of this innovation. By this improvement, the concentration of the luminous rays in the camera was increased in intensity, and the duration of the exposition to the sun's rays was reduced to three or four minutes."—A TREATISE ON THE DAGUERREHTYPE BY AN AMATEUR.

unites, together with the truest expression, the most exact likeness, and the most exquisite finish of the details which are produced, without detriment to the effect of the masses, or to the correctness of the lines; that is to say, all the perfections of which the art is susceptible.*

ON THE CHOICE OF THE APPARATUS.

Many persons being at a loss what apparatus to choose, when they wish to purchase one, a few words of advice on the subject may be useful.

If the apparatus intended to be purchased is destined almost exclusively for taking portraits, the one-sixth size, with one single achromatic lens should be preferred, especially if the purchaser intends to make it a source of profit, by the practice of the art. It is, as we have already said, the apparatus which, of all others, operates most rapidly. If that size were thought too small, the apparatus with a double object glass for the quarter-sized plate should be chosen. These two sizes are the most generally used.†

Those who will not be deterred by a rather considerable expense, and who have sufficient perseverance, not to be discouraged by the greater difficulties which attend the use of the half-sized or normal plates, will be amply rewarded for their pains by the splendid full-sized portraits, and magnificent groups, which may be obtained upon plates of these large dimensions.‡

ON THE LOCALITY.

The rapidity with which it is now possible to operate, allows of taking the portrait in any place, and at any time of the day; however, it is advisable for the opera-

* "Notwithstanding these admirable results, which would have been hardly credible if they had been obtained at the onset, and if they had not been the fruits of successive discoveries, and of the most persevering studies and labors, the photographic portraits, which have so many admirers, have also their enemies.

"Some, who are unacquainted with painting and drawing, and ignorant of the theory of shading, that of the chiaro-scuro, and of the laws of perspective; will never admit that anything of a good effect can be obtained without the use of colors. They reckon as nothing, that admirable gradation of light and shade—that perfection in the relief—that purity of outline, which constitute the principal charm in photographic images. In a word, the most exact reproduction of nature is of no value in their eyes, if it appears divested of its colors. This class of adversaries is unfortunately more numerous than is thought; but it is not our province to teach them the elements of art or taste.

"Others refuse to admit in the daguerrean pictures, anything more than a mere copy of nature, which though faithful is cold, unmeaning, and devoid of that divine animation, in which all the talent of the artist and the merit of works of art consist. The portraits which are executed every day, in which the harmony of the attitude unites with the expression of the face, are there, to refute triumphantly if not to convince them. It is true that a great number of photographic portraits are daily exposed to view which would almost make one despair of the art; but have the masterpieces of a Rubens or a Raphael ceased to be admired, because so many trashy productions have since their time been produced?

"But the most dangerous enemy which the daguerreotype has had to contend with, is, incontestibly, human vanity. When a portrait is executed by the ordinary method, the flattering pencil of the artist can soften any harshness in the features, give suppleness to any stiffness in the attitude, and to the whole figure grace and dignity. It is chiefly in this that the talent of the portrait-painter consists; we require, it is true, that the picture should be a resemblance; but above all, we desire a handsome one: two conditions which are often incompatible.

"Not so with the photographic artist; unskilful in the art of flattering or correcting the imperfections of nature, his portraits have unfortunately the defect of being often too true; they are in a manner permament mirrors, in which our self-love does not always permit us to look with pleasure."—A TREATISE ON THE DAGUERREOTYPE BY AN AMATEUR.

† This will, undoubtedly, appear to be strange advice to American Daguerreotypists, who are acaccustomed to see in our larger galleries, pictures on plates 9 × 11 inches. This whole section must have been written for the first edition and inserted in the third of M. Lerebour's work without alteration to adapt it to the improved state of daguerreotype manipulation at the present day. No more difficulty is now experienced in obtaining pictures with the largest instruments, than formerly with the medium. The perfection to which cameras of all sizes have been brought by Voigtlander of Germany, and by Mr. C. C. Harrison and Mr. John Roach of New York, enables a very indifferent operator to produce better pictures now, than were made by the most skillful ten years ago.—*Ed.*

‡ *Dimensions of the Plates for the Different sizes of Apparatus.*

	m.	m.	In. Fr. m.
The normal or full sized apparatus, with plates of the size of	0. 16	by 0.22	(6 × 8)
Do. 1-2 size plate	0.12	" 0.16	(4 1-2 " 6)
Do. 1-4 "	0.08	" 0.11	(3 " 4)
Do. 1-6 "	0.07	" 0.08	(2 1-2 " 3)

tor to choose the most favorable conditions in both respects.

In order to obtain impressions with the rapidity we have spoken of in the foregoing chapters, it is desirable to choose for the situation in which to operate, an open terrace; but, at the same time, to avoid being exposed to the direct rays of the sun, against which a screen, or a piece of gauze, may be raised. In any case, the object to be reproduced should always receive a little more light on one side than on the other, and should be placed underneath a kind of canopy, either in cloth, canvas, or a more solid material, so that too much light may not fall upon the top of the head and the forehead. With the precautions above mentioned, the model receiving from all sides a diffused light, will be exempt from the harshness inseparable from portraits taken in the sun.*

To produce a portrait in a room, the operator should place himself within a few feet of a high window, the apparatus being placed close against it: in places where the walls are dark, one or more sheets of white linen, or cotton cloths, are hung up so as to reflect the light upon the model. The portraits thus obtained, may receive the light either in front, or from the side according to the taste of the artist; they have in general a more defined outline than those taken in the open air.†

It is impossible to determine positively the precise duration of the exposition in the camera; those who wish to form a correct idea on the subject, may consult the 7th chapter. It will be understood that the operator will be guided by what has been previously said; but he must observe, that in the interior of a building, the light being admitted by a single window, at a greater or lesser distance, this opening is very small compared with the extent of a semi-horizon and at an angle of at least eighty degrees, which is the extent of open sky in the portraits made on a terrace, or in a garden.‡

The portraits obtained in the sunshine have strong contrasts of light and shade, and a great degree of vigor in the outline; it is possible with that strong light to obtain delightful groups full of life and animation. They will be, as will be easily conceived, invaluable to the artist in more than one respect; but in general, they will seldom be agreeable as portraits, for very few persons can endure so strong a light without distortion of feature,§ neither do we mention them but as exceptions.

It is particularly recommended to amateurs, and still more particularly to those who devote themselves to the daguerreotype as a profession, whatever be the light employed, to make it fall upon the model in a proper manner, and, not only give it a pleasing and natural position, but to choose that which is the most favorable.|| The

* Taking portraits in the open air is almost entirely a European practice. It is seldom indulged in America. All our large establishments are provided with such admirably constructed sky-light and side windows that not the slightest difficulty is experienced in obtaining pictures equally quick and more excellent than they can be procured in open air. As there is much inquiry regarding the best method for constructing a sky-light, we will give directions for making one that will prove excellent on trial, in a future nnmber of the Journal. —*Ed.*

† The *rest* for the head, excepting when operating instantaneously in the sunshine, is indispensable, if you wish to obtain a perfectly defined portrait.

‡ To give an idea of the difference of time necessary for taking a portrait inside a room, and outside, in the full light of day, we may mention what took place at the Palace of the Tuileries when Mr. Claudet and I were admitted to take portraits of the King, and a part of the Royal Family. The sky was at the time veiled with very luminous white clouds. At about the distance of six feet from the immensely large windows, which are towards the garden (that is to say, towards the south), it took us eighty-five seconds with the one-fourth apparatus, with a double object glass. All the circumstances remaining the same, but in the open air, on the Terrace of Philibert Delorme, fifteen seconds were sufficient; and thus we were enabled to obtain by this exposition, several good portraits in less than a quarter of an hour.

§ There are many persons who cannot sit for a portrait in the open air, even when the sky is clouded; thence our canopy of blue glass has been of great use to us for persons with weak sight, and to operate in windy or rainy weather. However, the blue glass is not indispensable, and the same effects may be produced by light hangings of that color.

|| For the apparatus of the one-sixth size, and for all those with a very short focus, care must be taken that all the parts of the figure should be as near as possible equidistant from the object glass. The legs should be turned sideways in order to avoid giving undue proportions to the feet and knees. For the same reason, the hands should not be advanced too far from the body, or they would

taste of the artist is, in this case, of the highest importance; for, the two greatest difficulties in making good portraits consist, in our opinion, (the apparatus and elements being of the first quality), in the good preparation of the plates and in the proper position of the model.

As a general rule, if you take a bust the apparatus should be placed at about the height of the eyes; the effect of which will be, that the upper part of the head, the seat of intelligence, will acquire a slight development. Some persons' likenesses require to be taken full face, the greatest number only three-quarter face; whilst others, which look extremely well, and produce a very fine profile, would have no charm in the other two positions.

To avoid the unpleasant effect produced when the eyes are represented as immovably fixed, which occurs whenever the person whose portrait is to be taken rests his eyes upon a near point during the operation, it is advisable that the sitter should look *vaguely* at a distant object; if, during the time that the sitting lasts, the mind were actively occupied with a serious or pleasing thought, according to the expression that may be desired, but without being at all preoccupied with the object towards which the eyes will be turned, the portrait will be full of animation and intelligence.*

OF THE DRESS AND BACKGROUNDS.

During the first period of the discovery of the daguerreotype, one of the strongest arguments dwelt upon by its enemies was the small number of cases in which it was applicable.

Thus, in order to take a general view of a town or edifice, it was necessary that these objects should receive the light in a nearly uniform manner, without which the dark parts would not *come out* when the light parts, illumined by the rays of the sun, were *passed*. It was from the same cause that they never could obtain a complete portrait of a person who had on a white waistcoat and a black coat. Fortunately, as new accelerating substances were successively discovered, they were found endued with the singular property of lessening proportionably the difference of action which exists between two bodies differently illumined and of different colors. It is thus that at present, in the views that we take in the sunshine in a fraction of a second, with the apparatus of the 1-6th size, the clouds, buildings and trees are reproduced all at once, and each according to its value.

From what precedes, it will be under- that the choice of a background and the color of the dress of the party sitting, have less importance than formerly.† However, as a general rule, it is advisable to adopt dark-colored clothes; silk and satin gowns give fine reflections of light, and the Scotch plaids especially will be reproduced with such variegated tints as to represent in some sort their colors.‡ The only inconvenience attending the use of light-colored or white clothes is to make the face appear darker, by contrast, than it is in reality. Notwithstanding, the operator would do wrong to banish them entirely from use: for example, blond, gauze, or net collars, for ladies, will produce very pretty effects.

The background adopted should be one which will reflect light upon the clothes, but which, however, should come out less than the face, otherwise the latter would appear dark. The backgrounds which we would recommend according to the complexion are the following: a yellowish white, a light grey, and a very dark grey;§ though we

appear enormously large. However, these defects are only apparent, even with an apparatus constructed with a short focus, when you operate too near.

* These directions will be found to coincide with our remarks on *position* in our second and third edition of the "ART OF PHOTOGRAPHY."—*Ed.*

† We saw, a few days ago, in the hands of Mr. Eynard, the finest group that ever was produced on a large plate. The background had been taken from nature, and contained some young trees, amongst which, several firs. One of the figures was dressed entirely in black, and one lady had a white bonnet; notwithstanding which, nothing was burnt or solarized, but every part of the picture had come out perfectly.

‡ When the clothes are dark, you must make use of the black cloth curtain, which is let down before the object glass, in such a manner as not to allow the rays of light reflected from the face and linen to pass through it but only those from the dark parts of the dress. Experience will teach what should be the prolongation of the exposition for this part of the picture.

§ The latter for very fair and light-haired persons; for elderly persons, and ladies with a white cap or bonnet.

do not mean to say other colors may not be equally good: for example, an old woolen blanket will produce an excellent background, whether it be spread out, and some pictures hung on it for ornament, or disposed in drapery as a curtain, or allowed to fall naturally.* For a full length portrait, it would be well to add a few pieces of furniture of an elegant shape, such as a lady's work-table, a book-case, or some such ornamental pieces of furniture, and to dispose tastefully upon them a few books, glass ornaments, a vase containing flowers, objects of art, &c.

Thus much for plain backgrounds; but, as often as it is possible to obtain one representing either a landscape or the interior of an apartment, it should be adopted in preference; for, if it be properly selected, that is to say, one of a dull color, and consequently allowing the portrait, which is placed in the fore-ground, to receive the more vigorous effects of the intense light, the effect will be extremely harmonious; the portrait will be thrown out in admirable relief, and, to use a common expression it will seem to stand out.

Mr. Claudet is the first who had the happy idea of thus placing painted backgrounds behind the persons whose portraits were to be taken. According to this idea, the operator might be provided with different subjects, such as a landscape, the interior of a drawing room, a study, or library, &c.

ON THE COLORING OF PORTRAITS.

The question whether it will ever be possible to reproduce colors by the daguerreotype is one which has much and deeply occupied the attention not only of photographists, but of the public in general. It would be rash to raise any expectations of the solution of this problem, which if ever solved at all, will probably be so by some happy result of chance.†

The public papers have often announced that Mr. So-and-so, of such a town had discovered the means of reproducing colors by the daguerreotype. Many operators, some of whom were perfectly sincere have imagined that they had made this discovery because they had obtained two or three different tints on one or more plates. That, however, was simply the result, as every one may have remarked, of the more luminous objects having assumed in the picture a blue cast, while the other parts, which had reached their proper color, remained of a white or bistre tint. Many persons have latterly announced being able to reproduce portraits with colors. It would have been more correct to say that the portraits were first obtained and colored afterwards. Several patents have been taken out in relation to this matter, and we shall abstain from giving an opinion as to what may be contested in respect to the rights they confer; we shall content ourselves with simply alluding to the fact. The first, obtained by Mr. Laicky, is drawn up in such mysterious language that we frankly acknowledge our inability to understand it. It appears, however, to result from the use of water-colors applied by some seemingly dexterous process. The invention of Mr. Lèotard, of Leuze, consists in pouring upon the plate a solution of gum or starch, heated, by contact with hot water in a separate vessel, and laying on the surface of the plate a transparent membrane or a vegetable paper; and then colors, mixed up with spirits of wine and gum, or else with white varnish and alum, are applied upon this membrane.

Mr. C. Chevalier has given a method, which we will now proceed to explain. Before fixing the glass destined to protect the portrait, it must be placed on the plate exact in the position which it is meant to be in, and slightly trace on its exterior face the outline of the entire bust, and the lines of the different parts of the portrait; and then, with transparent colors,‡ lay on the dull tints, corresponding as much as possible with those of the parts which they are intended to represent. When the painting is quite dry, the glass is fixed and the tracing effaced. The tints and half tints of the proof, visible through the trans-

* A moleskin colored back ground gives a very rich effect on the plate. The color most generally adopted, however, in this country, is a brown made by mixing burnt umber or vandyke brown, vermillion and yellow ochre. Panneling the back ground gives a decidedly artistic finish to the picture.—*Ed.*

† The occurrence of this happy chance we have already announced in former numbers of our Journal.—*Ed.*

‡ The operator must make use of the colors with which the glasses for the phantasmagoria are painted.

parent colors, will impart to the latter the shades they are wanting in, and an effect will be obtained which will resemble very nearly that produced by colored lithographic prints.

The following is the unpatented process which has been communicated to us by Mr. Claudet:—Take some colors (those used in water-color painting,) in impalpable powders; these colors are pounded over again with spirits of wine, and when dry they are again pulverised with a glass pestle.

To give the first tone to the portrait, you dip a very finely-pointed hair pencil into spirits of wine; take a little color of the proper tint, but very little of it, and apply it upon the plate.

This first coating must be a very slight one; and it would be much better to go over it two or three times than to lay on at once a quantity of color which would cause a stain, and which you would have a great deal of trouble to take off. This first operation is intended to make the pulverised color bite, and it is afterwards applied with a dry brush.

This process, simple as it is, requires some notions of painting; for, even when used by *artists*, it gives results which are *always inferior* to a very fine photographic impression; still more so, if a person unacquainted with the art of painting, merely applies a little red on the cheeks, lips, &c., the effect is, in our opinion, decidedly bad.

We should not have dwelt so long upon this subject, but for the interest which many persons take in it. For our own part, we are not at all admirers of the process, as we think that to daub over, by the hand of man, a photographic image, which is one executed by Nature herself, is much like having one of Madame Mirbel's exquisite miniatures retouched by a sign-painter.*

CHAPTER XII.

Of Interiors.

It is agreed to designate, under the appellation of interiors, those impressions representing groups of objects of art, such as furniture, statues, or busts in marble or plaster, &c., bronzes, crystal articles, silk or woollen stuffs, armory, objects of natural history, &c., &c. To obtain a satisfactory result, the first point necessary is to know how to group them with taste, which cannot be taught; but there are some conditions of success which may be pointed out: as we have practised but little on these reproductions, we shall have recourse to the notes of Mr. Hubert.

"To obtain a good reproduction of the objects in question, it is best to choose the time when the sky is partially clouded; and if, during a part of the operation, you are so fortunate as to have an occasional glimpse of sunshine, the impression will be very harmonious; the shades produced, instead of being of a dull black tone, will be perpectly transparent, for the details will have had time to be formed in them by the diffused light, and the sun's rays will give the most brilliant touches.

"Few persons have in their possession collections of iron armor, bronze vases, stone or marble capitals of columns, wood carvings, sculptures, &c., but they may, with simple stained plaster models, obtain, with little cost, all the treasures of our museums. It is thus that I have, for my own part, converted into valuable matter some old models, by only daubing them over with colored wash; for it is not at all necessary to color the object that you wish to copy to the exact tone that it would have in nature; it will be sufficient to give it a color having a relative appoximation to that you wish to represent. You may, for example, use indifferently green or red to obtain in the impression the same value of tone.

"Plain or cut-glass objects, glass or crystal vases half-filled with water or colored liquids, still-water employed as a reflector, objects of art in bronze, gold, or silver—those of a black or very dark red color, but varnished or polished like Etruscan vases, are highly favorable in this case, by the contrasts which they produce, and by the play of the reflection of light resulting from the polished or varnished surfaces, the reflection of the surface of the water and liquids, and the glistening of the glass and crystals.

"Subjects composed entirely of plaster figures, or of white drapery, are more easy

* We find all artists of refined taste are of the same opinion in regard to coloring daguerreotypes with the brush. It certainly—even when performed by skillful hands—adds nothing to the beauty of the picture, but, on the contrary, is decidedly objectionable. We are often disagreeably affected by seeing beautiful daguerreotypes thus outrageously ruined.—*Ed.*

to execute, but they become monotonous, are often undefined in outline and devoid of effect; it is therefore better, in certain cases, to introduce objects more or less colored, and thus obtain by contrast and by narrowing the field of light, blacks and whites of greater intensity.

"These compositions should be arranged in a place open at the sides, at which the light is to be admitted, and placed, if possible, on a turning-easel, in order to choose the most proper disposition of the light. On exposing these objects entirely in the open air, it often happens that the light of the sun, combined with that of a very luminous blue sky, destroys a part of the modelling. It is therefore preferable, for modellings and sharp effects, only to admit the light by one side.

"As naturally diffused light, with an echo of more vivid light, is not always to be obtained during the intervals of sunshine, as you wish, it has often happened to me, with a partially clouded sky, when the sun, at intervals, appeared more than I wished it, to hinder momentarily the action of the light by covering the object-glass, with its diaphragm made very moveable, or for more precaution with my handkerchief, until the next cloud arrived.

"Very pretty effects are also obtained when the sun, throughout the operation, being slightly veiled, either by a mist or clouds which intervene, has yet sufficient force to produce shadows. In such cases, the light not being too vivid, the operation may last longer, and the details in the shade have time to come out.

"Chance has also sometimes furnished the means of producing some very striking effects of light, which I should never have thought of. I allude to a vague and slight shadow which concentrated the light on a certain point of the picture, though the whole was illumined by a bright sunshine; it was occasioned by the extremity of a very slight branch of a tree divested of its leaves, and interposed between the sun and the object upon which its beams fell. It was impossible to perceive in the impression the slightest trace of the form of a shadow, nor even any difference of light resulting from the interposition of this slight object (which was at a distance of fifty yards), and yet this effect was very plainly discernible on the plate, which was subjected to the same operation four days running, at the same hour, and under all the same circumstances.

"In order to operate successfully when the sky is clouded, with an occasional echo of light, it is necessary, when the sun shines out powerfully, to use a very fine gauze, the threads of which must be, however, sufficiently apart to allow a little of the direct light of the sun to penetrate between them; and when the operation is nearly finished, for those parts that are in the shade, take away the gauze, and allow the sun's light to give the finishing touch to the lights of the picture."

CHAPTER XIII.

On Figures from the Life.

WHAT we have just said of the reproduction of objects of art, may be equally well applied to that of figures from the life. For these latter, in the absence of a competent study of art, the operator should possess a very positive artistical taste, as the choice of the attitudes presents numerous difficulties.

More than for any other reproduction, you must not place the apparatus too near the model, and should avoid the different parts of the body being at too-widely different distances from the object-glass.

The operator must not be too prodigal of accessories, as a great degree of simplicity often adds to the merit of such pictures. He should therefore prefer handsome hangings, of a dull tone of color with large folds, to a background of too brilliant a pattern.

The first figures from the life that we took, two years ago, were so far successful, that the greater number are now in the hands of the most eminent artists. We intend soon to produce others.

For all these productions, and for groups composed of several persons which require to be represented with precision, the operator must not confine himself to fix the focus according to the adjusting lines; but he must examine repeatedly the image on the ground-glass; by which means he will be able to secure a good general effect, and will often discover and remedy a number of unfavorable details, which might have

escaped his attention had he only looked at the group itself.*

CHAPTER XIV.

On Views.

We comprise under this denomination those pictures representing either an edifice, a general view, or a landscape. For the preliminary operations you must conform to what has been said at the beginning of Chapter VII. For a view with an extended horizon, or for the reproduction of a landscape, you must take great care not to adjust the point of view by the distant parts; but, on the contrary, reserve all the clearness in focussing for the first and second range of foreground. The choice of the position given to the apparatus is of very great importance to the result. In taking an edifice, withdraw, where the nature of the ground will allow it, to a distance of double its greatest dimension; you will thereby avoid making it appear on the plate as if cramped for want of room. It is also requisite to choose a position at an elevation of about one-third of the total height of the edifice; othewise in order to take the whole of it, it would become necessary to incline the camera, and then the vertical lines, which ought to be perpendicular and parallel to each other, would, as Mr. Hubert observes, meet at an accidental point of incidence of the sky, and cause the edifice to appear as if falling.†

Avoid as much as possible reproducing on the same plate an old edifice darkened by time, and a new or light colored one. The time necessary for taking the first exceeds, by a great deal, that required for the latter; hence, it follows that the new building would be more or less overdone before the other would have time to come out: however, when the case does occur, you may surmount this difficulty by making use of the black cloth which we have before recommended to be placed in front of all cameras. This is evident, for, if the part of the picture which has most light on the right, it will be easy, with the cloth, to prevent the rays which come from that part reaching the object-glass. Recourse may be had to this expedient in numerous circumstances, and it will even be *almost always* indispensable when you wish to hide the sky during a part of the operation, and hinder it from being overdone; for example, you must not fail to use it every time that you wish to obtain a reproduction of fine groups of clouds. If you have not a black cloth, you may make use of a *red* handkerchief; indeed, it has often happened to us, when in the country, to use a thick green leaf of a tree, the form of which sometimes adapts itself *perfectly* to the part that you wish to hide. In order to ascertain exactly the effect produced, and to avoid acting hap-hazard, examine attentively, during the first experiments, the effect produced on the ground-glass.

It is chiefly in the reproduction of landscapes that one is often obliged to hide certain parts of the picture; and the reason is obvious: it frequently happens that you have to make the study of a tree, or else that the picture is formed of two perfectly distinct zones; on one part, the ground covered with vegetation, and the sky on the other. Now, it is well known that the green colors are the most difficult and tardy in coming out, whilst the sky is reproduced with extreme rapidity. In the

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* Our author is not sufficiently minute on this subject. It is one on which the operator cannot devote too much study, and we shall take occasion hereafter to enlarge upon it,—*Ed.*

† "There are certain views which it is very difficult and almost impossible to represent; they are those in which the operator is obliged to place himself near an object composed of conspicuous and distinctly marked lines of view. In such a case, if you have a building or interesting site to take, and wish to have all the details with exactness, the best method to adopt is, without changing the position of the camera, to take several proofs, changing the focus for the different lines of view that you wish to obtain.

"But if you had only time to take a single impression, then you must select the most interesting point of the view for adjusting the focus, even though the other parts should be introduced with a certain degree of vagueness.

"I can corroborate the propriety of this advice by adding that, in following this method, the operator would be imitating that of very eminent artists, who have adopted it after numerous observations and a close study of nature, and who, in order to attract the attention of the spectator to the most interesting part of the picture, devote all their talent to its embellishment, and purposely neglect what is only accessory." — *Notes of Mr. Hubert.*

The reader will see that the opinion of Mr. Hubert agrees with that which we have ourselves expressed, relative to the effect that one should endeavor to produce in a picture.

first case, we have often used with success an indented leaf which masked the whole of the sky, and which allowed time for the tree to come out with good effect. In the second case, the use of the curtain to mask the sky is extremely easy and convenient; it is only necessary to raise it entirely for the first part of the operation, and afterwards to lower it to the line of the horizon, at which point it should be kept in motion until you entirely shut out the light. In taking views of glaciers, or mountains covered with snow, it is impossible to obtain the least effect unless you employ this curtain.

CHAPTER XV.

Observations on Mr. Daguerre's Process.

SEVERAL theories have been successively propounded, to explain the various phases of Mr. Daguerre's photographic processes. Here follows a succinct account of them, such as is given by Mr. Dumas, Professor of Chemistry to the Faculty of Sciences, in his instruction to his class:—

1. PREPARATION OF THE PLATES.—All the processes recommended for preparing the plates, such as the rubbing with tripoli, either with acid or spirits of wine, are intended solely to lay bare the metallic surface; therefore, the nature of the polishing substance used is a matter of indifference; the only essential condition is to leave no residue on the silver; and Mr. Daguerre's late communication has no other object than to enforce the necessity of completely baring the silver by a still more perfect method of cleaning.

2. APPLICATION OF THE SENSITIVE COATING.—The yellow gold tint produced on the plate by the coating of iodine, is caused by a very thin film of iodide of silver. This color is not that which is peculiar to the iodide, for that compound is white, and it only acts in this case as a thin lamina; so true is this, that, when the action of the iodine is prolonged, the yellow coating is seen to pass successively through other gradations of color.

Mr. Dumas has ascertained, by the augmentation in the weight of the plate, the probable thickness of the coating of the iodide of silver.

A plate of 5760 square millimetres of surface, weighed first with nicety, having been brought to the tint of straw-colored yellow by being exposed to the vapor of i dine, was afterwards re-weighed with the same nicety, and the tare exactly ascertained: there was an increase of weight certain and evident, but it did not amount to one half of a miligramme. When the shade became of a yellow gold color, the increase of weight reached half a milligramme. By prolonging the duration of the action of the vapor of iodine beyond the necessary time—in quadrupling it, for instance—Mr. Dumas obtained effects which could be easily appreciated in the scale, there being an augmentation of weight of two milligrammes. He supposed that a quarter of the quantity would have sufficed to form, over the whole surface, the quantity of iodide necessary for the production of the image.

But in calculating the weight of the iodide of silver, which this iodine represents, and in calculating the volume of iodide which corresponds with this weight, you may arrive at the appreciation of the thickness of the coating of iodide of silver deposited on the surface of the plate.

This thickness does not equal one millionth part of a millimetre.

3. FORMATION OF THE IMAGE.—The action of the light upon the iodized plate in the camera is not visible. It is probable that its effect is to raise, or crack the coating of iodide of silver, which allows the mercury to come in contact with the silver surface of the plate, whilst the iodide that has not been affected by the light remains the same.

When seen through the microscope the mercurial coating presents a very irregular and granulated surface; each particle composing which is of 1-800th of a millimetre in diameter. The white parts are covered with them, the half tints have them in smaller quantities; the dark parts have none at all. In a word, the mercurial particles are deposited in quantities proportioned to the coruscations of the iodide of silver.

It may be asked, in what consists this coating of mercury? In the opinion of Mr. Dumas, it is mercury in powder merely deposited on the surface of the silver, but not amalgamated with it.

No theory has been as yet proposed as to the formation of images by yellow

glass; and we think that the explanation of this phenomenon could hardly be made to agree with the theory of Mr. Dumas. When examined through the microscope with an amplification of three hundred times, the impressions made with the yellow glass present exactly the same aspect as those produced with the mercury; only in the latter, the white globules, particularly those which are formed on the dark parts of the picture, are much more numerous than those on the impressions obtained with the yellow glass.

4. THE HYPOSULPHITE WASH.—This wash is intended to deprive the plate of the iodide of silver. This iodide, if left on, would soon assume a very dark tint, and would give the picture a very disagreeable tone of color.

5. THE FIXING BY THE CHLORIDE OF GOLD.—The object of this operation is to cover the daguerrean plate with an excessively thin gold film, which augments the vigor and lights of the picture, and renders it indelible without in the least affecting its distinctness.

CHAPTER XVI.

Preparation of the Rottenstone and Tripoli.

THE pulverised rottenstone is a substance which can be had at so cheap a rate, and the processes by means of which it is prepared are so simple, that it is useless to point them out; only, the rottenstone which is sold in general being very coarsely pulverised, we shall here give the means of preparing it as fine as it is required, at very little expense.

Put a small handful of the rottenstone usually sold into a large decanter-full of water; shake it briskly during a few seconds, and then let it settle. Of course the largest grains are immediately precipitated to the bottom; those of a smaller size will be two or three minutes before settling down; and at the end of four or five minutes there will only remain in suspension and extremely fine powder. You therefore let the mixture remain still during about that time, and then pour off a part of the liquid, taking great care not to shake it, into a large funnel lined with filtering paper. All the rottenstone that is in suspension will remain in the funnel. Put some more water and rottenstone into the decanter, and shake it again, and then proceed as you did the first time.

The rottenstone when withdrawn from the filter, should be dried in a crucible or porcelain cup, then put immediately into the little bag or small bottle covered with muslin, and kept in a very dry place.

OF THE TRIPOLI.

THE tripoli in pieces should be of clear yellow tint, soft to the touch, but without feeling too unctuous.

To avoid loss of time, the tripoli which contains too many foreign substances should be rejected; and it is easy to verify that by breaking up some pieces of it. When it has been pulverised with the pestle, put the powder into a crucible, which heat strongly, but not to a red heat. Put this powder into a large decanter, and proceed as with the rottenstone; only, to be deprived of all humidity, the tripoli requires to be calcined more than the rottenstone.

OF THE ROUGE.

THE English rouge ought to be of the first quality; for if it contains greasy matter, or gritty particles, it would be better to dispense with it, and use only the tripoli. It cannot be prepared by an amateur.*

* See our directions in the January number.—*Ed.*

To be continued.

MERCURY.

This metal is distinguished from all others by its fluidity at common temperatures. It has a strong metalic lustre and is the color of tin. The atomic weight of mercury is 200 ; it boils at 680° Fahren., and becomes solid at 39° or 40° below zero. It contracts very much in congealing Its specific gravity at 47° is 13·545, whilst that of frozen mercury is 15·612. In its solid state it is malleable, and may be cut with a knife.

Mercury is often found native, but is most generally obtained from native cinnabar. It is procured by mixing lime or iron filings with cinnabar, and exposing the mixture to heat in an iron retort. The neck of the retort must be placed under water in a vessel. The heat being applied displaces the mercury and it is distilled over into the vessel containing the water.

Mercury that is perfectly pure does not tarnish when exposed to the air, nor does any film collect on the surface when agitated in a bottle. It can be completely evaporized by exposure to heat.

Nitric is the only acid which will act upon mercury at common temperatures; sulphuric acids affecting it only when heat is applied. No other acids have any action upon it.

The following "*Observations on certain molecular actions of crystaline particles, and on the cause of the fixation of mercurial vapor in the Daguerreotype process,*" are from the pen of Dr. A. Weller, and will prove very interesting to the Daguerrean artist.

Mercurial Vapors:

BY AUGUSTUS WELLER, M. D.

When a piece of glass is covered with a solution containing the double phosphate of ammonia and magnesia, and traces are made upon it by any hard body, it is known that they become visible shortly afterwards by the salt being precipitated upon them. Berzelius, who mentions this test in his Elements of Chemistry, states that Wollaston proposed to make use of this fact as a test of the presence of magnesia in solution, which has since been frequently adopted. According to Berzelius, "the cause of this property is of a mechanical nature, probably from the glass being covered with microscopic crystals, the facets of which take a different position on the traces, for some reason which is not easily explained." More recently, Prof. Liebig has alluded to this subject in his Vegetable Physiology. These effects are referred by him to a state of unstable equilibrium of the various particles which compose the liquid, which is destroyed whenever a dynamical action is created sufficiently powerful to overcome the feeble attractions, or the inertia of the molecules in solution. He ascribes to the same cause the sudden solidification of water, which had remained liquid when below the freezing-point, upon being agitated ; the pricipitation of a mixture of potash and tartaric acid ; also the detonation of fulminating powder from the contact of any solid body. Neither of these eminent observers mentions having submitted these traces to microscopic observation, although that is the only manner to test the hypothesis advanced by Berzelius.

On the present occasion it is my intention to describe some observations I have made, in order to elucidate the influence of molecular action on the precipitation of saline bodies, similar to that observed in the double phosphate, and to show that a similar influence is exerted over bodies in a gaseous state and in a state of vapor, and afterwards to point out some phenomena hitherto unexplained, such as the fixation of the mercurial vapors in the Daguerreotype for instance, which evidently depends upon a like cause.

In order to obtain the double phosphate, I have generally used a solution containing about ten grains of phosphate of soda with about three of carbonate of ammonia in an ounce and a half of water. I have preferred this mixture, because the ingredients are more easily procured, and are less acted upon by the atmosphere than the phosphate of ammonia. The magnesian solution was generally a few grains of sulphate of magnesia to the same quantity of water as above.

A small quantity of the first mixture is poured on a piece of glass, and to this are added a few drops of the magnesia in solution ; if it be allowed to remain undisturbed,

in a few minutes the surface of the liquid becomes covered with a thin film, and on the glass appear minute shining crystals; but if before those crystals have time to form, any solid substance, as a glass rod or an empty pen, for instance, is passed over the glass through the liquid, the course it follows becomes visible shortly after. The images which are thus formed are double, and may be termed the upper and lower images.

I will first describe the upper images;—They appear on the surface of the liquid itself, when the film would otherwise have been formed. They are seen immediately after the passage of the pen through the liquid, whereas the lower ones only become apparent a few moments after. Being formed on a moveable surface, they are not perfect representations of the traces that have been made, and are changed and distorted by any movement of the liquid.—When the solution of the salt is weak, they frequently disappear in a few moments after their formation and are redissolved in the liquid; when the liquid is more concentrated, they likewise disappear, owing to the formation of the film on the surface. The production of these images appears to be independent of the chemical nature of the body used for tracing. They may be obtained independently of the lower ones, by drawing a thread gently over the surface of the liquid, without its coming in contact with the surface of the glass.

The lower images are formed on the surface of the glass, under the upper ones. A few seconds after the tracing has been made upon the glass, they begin to appear, and gradually become more distinct. The space of time which elapses before their appearance depends upon the strength of the solution. When it is strong they appear quickly, and when weak they take several minutes before they are visible.

To cause the formation of any images, the tracing must always be made after the mixture of the two solutions; under no other circumstances have I been able to create them. Thus, when the tracing is made on a perfectly dry glass, or on one slightly wet, and then immediately covered with the solution, no image will be created. This is likewise the case when we make traces in either the magnesian or the phosphate solution before their mixture together.

The passage of any solid substance in the proper solution on glass will cause the formation of a deposit. Wood, glass, slate, and other similar substances, all have equal power in this respect, but metallic substances are less active. Other polished surfaces may be used instead of the glass plate, and I have formed these images on quartz and agate with the same effect.

The difference of crystalline texture exerts no influence, but the images seem to be with more difficulty produced on polished silver and copper than on a vitreous surface.

A very slight degree of friction will excite the formation of an image, although a moderate degree of pressure is more favorable.

Electricity exerts no influence in the formation of these images. In one experiment, in order to diminish the friction, I adapted two fine wires of a spiral form to a battery sufficiently strong to decompose water freely. These wires were moved through the solution in various directions, and the marks of the passage of the two poles became equally apparent without any difference on either side; and when afterwards disconnected from the battery and used in a similar manner, they produced the same effects.

It is remarkable with what fidelity the traces of lines become visible in this manner. Letters thus formed by a pen, are much more faithfully rendered than when written on paper with ink, and lines may be formed which are scarcely visible to the naked eye. Microscopic inspection shows this extreme exactness to a much greater degree than could have been anticipated; for we see a simple line become as it were decomposed into a number of parallel lines, which represent the point of contact between the two solids. These lines are composed of very minute and confused crystals, of an irregular appearance and joined together Their diameter varies from 0·02 of a millimetre to about double that size. Betweeen these parallel lines are frequently seen others still more minute. The other crystals which become deposited by the common crystaline powers over the untouched parts of the glass, are much larger than either of these. When the point of

intersection of two lines is examined under the microscope, we perceive the appearance represented. While crystalline masses are in process of formation, it is impossible to prevent the deposition of crystals on other parts of the glass; but if while these are fresh they are subjected to a sharp current of water, the irregular crystals are mostly carried away while the images are left almost intact. It is therefore evident that the same power which causes this deposit, renders them more adherent to the surface of the glass than the other crystals. Another method of demonstrating the difference of their adherence, is by allowing the solution to dry on the glass, when by brushing it slightly with the feather of a pen, most of the irregular crystals are taken off and the images remain.

Other substances capable of forming a like deposit.—Chloride of platinum and nitrate of potash, mixed together, form a double chloride, with which images can be obtained with as much ease as with the double phosphate. The only difference is, that the double chloride precipitates in the shape of octahedrons, &c. Solutions of tartaric acid and nitrate of potash deposit chystals of bitartrate of potash, which are capable of forming upper and lower images with nearly as much facility as the double phosphate. The lower images formed by the bitartrate differ in one respect from those by the phosphate, for shortly after their formation they appear to lose their adhesion to the glass, and the slightest agitation of the liquid causes them to be detached; and if a sentence has been written, the curious appearance is presented of fragments of words and letters floatingabout in confusion. Under the microscope also they differ, fewer parallel lines are perceived, and the crystals are larger and unequal in size. Liquor potassic added to a solution of tartaric acid will form images exactly similar to those just mentioned. Caustic soda and tartaric acid produce the same result, but the solution must be much more concentrated.

Images formed by gaseous bodies.—These traces are formed in the same manner as those which are crystaline, by passing a solid body over a piece of glass covered with a liquid containing a gas in solution, when they are immediately perceived by the bubbles which are deposited. On account of the specific gravity of the gas, these images are not very durable, for after a short time the gas which composes them arises to the surface. As a general rule, the ingredients, whose combination causes the formation of the gas, should be added together gently, and so diluted that whatever gas is formed they remain dissolved in the liquid. I have been surprised to find how much gas may be in this way made to remain in solution; and as most of them appear capable of being dissolved in this unstable manner, traces may be obtained from them all; and I have ascertained by experiment, that such is the case with carbonic acetic and hydrochloric acids.

To obtain carbonic acid, I have generally used sub-carbonate of soda and tartaric acid. Acetate of ammonia was employed to liberate acetic acid, and hydrochloric acid was obtained from common salt and sulphuric acid. A mixture capable of forming traces has the property of disengaging its gas in bubbles, whenever it is brought in contact with any dry surface; as for instance, when a mixture of this sort formed on a slip of glass is caused to spread over a part of the surface which has not previously been wetted, bubbles of gas are immediately evolved on that spot, although none are perceived elsewhere. This effect is also produced with champagne, seltzer and other effervescing waters, which however have not the property of forming gaseous traces. Any surface, whether metallic or non-metallic, will be found to effect the separation of the gas from the liquid; and I have not perceived that there was any difference from the surface being perfectly polished or rough.

The immersion of a piece of bread champagne to renew the effervescence, is merely an example of the contact of a fresh surface with the gas; in a short time it ceases to have this effect, but if a fresh piece is used, the effervescence is renewed as before. The difference of effect between this and a piece of metal arises from the superior extent of surface presented by the cavities of the bread. The disengagement of steam from boiling water by platinum foil or any other solid substance, is likewise of the same nature. After a very short time this effect ceases unless renewed by a fresh surface. The most natural explanation of these phenomena, is to refer them to some mole-

cular action of the solid on the gas, probably of a mechanical nature, which lasts a very short time, when the solid acquires a "droit de domicile" in the liquid, and becomes perfectly inert. M. Legrand, who has made some correct experiments on the point of ebullition of saline solutions, remarks, that platinum possesses no power in equalizing ebullition after a few moments when, according to him, all the air has been expelled from its surface; but, on the contrary, zinc and iron will act as long as they are present in the liquid, which he attributes to their power of decomposing water.

Previously to showing the existence of the same action in bodies in a state of vapor or fume, I will make a short digression with respect to the constitution of vapors in general.

The term vapor is commonly applied to bodies in three different conditions,—1st, that of temporary gas diffused in the atmosphere; 2nd, that of liquid particles mechanically suspended there: 3rd, that of solid particles suspended in like manner. To the two latter, to speak more correctly may be applied the term of fumes. The first correspond to solution in a liquid, and the other to that of suspension in the same. As examples of the first, we have the vapor of water while in an invisible state, and those of bromine, &c. Of the second, water as in mists, fogs, &c., and of the third, the vapors of arsenic and of corrosive sublimate. Bodies in either of these conditions possess the faculty of assuming a definite crystalline form on becoming solid. The properties of the gaseous vapors are so well known, that it is unnecessary to dwell upon them here.

The second class, or the liquid globular vapors or fumes, which, as we have said, causes those accumulations known under the name of fogs, clouds, or mists, are those which I intend at present to examine, as they comprehend the theory of fixation of the mercurial vapors in the Daguerreotype. It was formerly believed that vapor or mist was composed of minute spherules or globules of liquid water, and in Newton's works we find evidence that such was his opinion. According to another view, first advanced I believe by De Saussure, these vapors were composed of vesicles or very minute bubbles, exactly resembling, on a small scale, the common soap-bubble. This opinion has received the assent of Fresnel and Berzelius, and at present obtains general credence. The proofs on which it is considered to be founded, are principally the observations of De Saussure, who asserts that on high mountains, or in the clouds, he has been able to detect these air-vesicles with the naked eye, and has seen them burst as they came in contact with each other. Berzelius recommends the examination of the vapor of water over a dark surface, such as that of ink, with a lens of a short focus. He says, that vesicles may be detected in this manner, varying in size from 1-4500th to 1-2780th of an inch, which occasionally burst as they touch each other. The suspension of clouds is also used as an argument in favor of the vescular theory, as it is contended that liquid spherules would descend to the ground by their specific gravity in such situations. Fresnel indeed compares the globules to small baloons which dilate or contract, according to the temperature of the air they contain.

A few days stay at the convent of St. Bernard gave me an opportunity of repeating the observation on the clouds, as mentioned by De Saussure, which may be also made in this season on our London fogs. Globules of various sizes in these circumstances are frequently discerned by the naked eye floating in all directions. I have endeavored to ascertain their vesicular structure, but have been unable to do so from direct observations. It is frequently a most difficult point, in microscopic investigation to decide upon the existence of a thin transparent membrane. It is still more so to pronounce upon the vesicular or spherular structure of globules in constant agitation; and I believe that if minute spherules and vesicles could be mixed together, we do not possess any means at present of distinguishing them.

I have never been able to detect that appearance of bursting of the globules mentioned by De Saussure, but sometimes, when the agitation of the air is slight, two of the larger globules may be seen floating towards each other, and afterwards disappear suddenly, which may be explained, if we admit that it is caused by the union of the two spherules, into one, which is too heavy to remain any longer in suspension and whose rapid deposition conceals it from the sight.

There may be urged as objections to the vesicular theory, that if the pellicle become extremely thin, the vesicle would no longer be perceived any more than the apex of an air bubble before bursting, or the central black spot of a system of Newton's colored rings. It will be seen below that the globules of vapor possesses the power of depositing themselves in a crystalline form, which requires a tranquil deposition of particles, such as could scarcely be deemed possible, if the air contained in each had to escape at the moment of its crystallization.

I have endeavored to fix the globules of water on glass and other substances, so as to be enabled to submit them to microscopic inspection, but from their volatile nature and other causes have not succeeded. However, it is easy to do so with almost any other volatile substance; and I have examined several in this way without detecting the slightest appearance of a vesicular structure. Mercury is deposited under the form of globular particles, with a metallic lustre whose diameter is 1-500th of a millimetre, in which I have never detected any internal cavity by the most careful examination.* Flour of sulphur is found to consist of solid globules, several of which adhere together; when acted upon by a gentle solvent, their external portion is dissolved, and there remains a regular octahedron. An interesting experiment may be made on the fumes of sal-ammoniac, which appear whenever muriatic acid and ammonia are brought together. Two small phials, each containing one of these substances are covered by an inverted tumbler; above the surface of the acid are seen at a short distance the fumes of the salt which at the end of a few hours are found to have condensed into a thin snowy pellicle, completely obturating the mouth of the bottle. This partition is so delicate, that the slightest agitation will cause it to fall into the liquid.

In all these cases it is found that the fumes possess the power of remaining suspended a much greater length of time than would be expected from the difference of their specific gravity with that of air which is also the case with the fumes of other substances, and smoke in particular. This can only be accounted for by the continual state of agitation of the air, even within an enclosed space, and by the elasticity of the solid and liquid particles. In the case of solid particles this can be readily admitted, but with regard to liquid globules, there is probably some action similar to that which takes place on the impinging of solid elastic balls, which after becoming flattened rebound in virtue of their tendency to recover their original shape.

The causes which act in fixing different vapors and fumes are the same as those which determine the precipitation of solid particles in solution, such as for instance, sharp points of any kind, minute filaments, and more especially the existence of a crystalline particle to act as a nucleus. Non-conducting substances, as woollen cloth, the nap of a hat, the web of the spider, &c. are covered with aqueous globules when no rain has fallen, and when polished surfaces near present no such deposition.

Having now shown the existence of a crystaline power in vapors, we shall proceed

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* In order that others who may wish to verify these results may operate in the same condition as myself, it is proper to state that the mercurial vapors were disengaged in a box, such as used in the Daguerreotype process; and after the mercury had been raised to a temperature of about 90 deg. centigrade, it was allowed to cool. Three experiments were made in this manner: in the two first the glass plate was placed four inches above the mercury, in the other it was eight inches distant. The appearance of the globules was the same in each case; if any difference existed in their size, those of the last experiment were rather larger. In another experiment, where a common Daguerreotype plate was substituted for one of glass, the appearance of the globules was in all respects the same. From the manner in which they are deposited, they appear to exert an influence over each other, as they are frequently found in groups of three or four, or more. Mr. Ross has stated on the part of Mr. Solly (Microscopical Society, December 1843), that these globules are deposited in hexagonial groups; but with preconceived ideas no doubt it would be very easy to form such shapes as it would be to form triangles or any other simple geometrical figure, particularly when the allusions inseparable from catoptric microscopy are added to those of physiology. This tendency of the mind, of which a good account has been given by Muller in his elements of Physiology, is so strong, that where groups of globules are concerned, I would always advise their being mapped down under the microscopic camera lucida, and put by for some time for future inspection. I shall have occasion to advert to this subject more fully hereafter.

to prove the influence of a force which disturbs this equilibrium in the same manner as in the saline solutions above mentioned. The friction of a solid body on glass will leave traces which are invisible until breathed upon.

Many bodies possess this property, but the mineral steatite or soap-stone, produces the effect better than any other I know. A considerable degree of friction may be used over the traces thus produced by steatite, without affecting the appearance of the traces when breathed upon repeatedly. The glass may even be heated considerably without affecting them. By examining with the microscope the parts that have been traced upon by steatite, we are unable any more than with the naked eye, to detect any material cause for the deposition of vapors in these places, as it probably depends upon the transparency of the mineral, which being so attenuated is unable to affect the rays of light. When the traces have been brought out by breathing upon them, they must be covered with another piece of glass which impedes the evaporation of the water and allows them to be submitted to the microscope. The parts untouched by the steatite present the appearances that have been already mentioned. On the lines created by the mineral, the drops of water are differently disposed, their long diameters being parrellel to the direction of the lines. These minute drops very much resemble the globules of gas deposited from a liquid, the only difference between the two consisting in the deviation from the globular form in the liquid traces, which evidently arise from the power which the water possesses of wetting glass.

It is evident, therefore, that the secondary cause of these images is a difference in the position of the minute drops of water, reflecting the light differently from the other drops which are irregularly disposed on the other parts of the glass.

There exists another 'method of fixing vapors, which has been long known, and to which I believe attention was first directed by Prof. Draper. It consists in merely placing a body on a plain surface, such as that of a metallic speculum, or even of glass; after a short time, it is found that simple contact such as this, has caused some molecular action, as the spot occupied by the object will become apparent by breathing on it in the same way as with the images of steatite. This observation is the more interesting, as it serves as a connecting link between the effects of mechanical power and those caused by other agents.

The experiments of Mr. Hunt have shown the influence of heat in causing the fixation of vapors.

An image of this sort formed on glass by the breath, when examined under the microscope, present exactly the same appearance as those formed by steatite. The same difficulty is experienced in bringing out, by mercurial vapors, the thermographic images, on glass, as is found with the traces of steatite, which possess but in a very slight degree the power of fixing mercurial vapors. It appears therefore that the power which water has of wetting glass, causes it to have a greater tendency to deposit than mercury, which does not wet glass. The cause of the production of thermographic images is evidently similar to that which causes the deposition of a solid body from a solution.

The fixation of the mercurial vapors in the Daguerreotype process which has excited so much interest, and for which so many theories have been advanced, is but another example of the force which causes the deposition of solid and gaseous particles from a liquid, and which produces so many other effects In this case the chemical rays of light act in the same manner as mechanical action and caloric in causing a certain molecular disturbance. By the discoveries of Moser, it is shown that these rays possess the power of acting upon almost any body, in such a manner as to render it capable of fixing the particles of various vapors. Thus simple minerals, glass, &c. may be made to fix the mercurial vapor.

It appears, however, that silver, gold, copper, &c., which form amalgams, or in other words, are capable of being wetted by mercury, possess this property in a greater degree than any other bodies which are incapable of being wetted by it; in the same way as we have seen that glass has the greatest power to fix the vapor of water. Admitting the truth of this theory of the Daguerreotype process, we are naturally led to inquire whether the same agent may not likewise cause the fixation

of particles in a state of solution or of vapor in the same manner as by simple mechanical action. After several unsatisfactory attempts I finally succeeded in clearly proving this fact. The solution which shows the influence of light the most evidently, is that of the neutral chloride of gold. A few grains of this salt dissolved in an ounce of water, when exposed to the light, deposits minute crystals of a metallic appearance on that side of the glass nearest the light.

The action of light in causing the deposition of gaseous vapors may be shown by placing some iodine in a bottle closed with a glass stopper. After being exposed to the sunshine for several hours, minute black crystals will appear on the side nearest the light, which will change their position according to the side of the glass exposed. Another substance which shows this action still better is camphor, a piece of which, merely covered with a glass shade, will give rise to a crystalline deposit, after an hour or two of exposure to light, and which presents the same phenomena as that of iodine. By a prolonged exposure these crystals become very abundant and very beautiful. I have applied this property to the construction of an instrument for measuring the chemical rays of light. As the details respecting this would be foreign to our present subject, I will defer them to another occasion, and confine myself now to prove that these phonomena are independent of the deposits caused by radiation.

1st. The crystals are formed on the side exposed to the action of direct or diffused light.

2nd. They are not formed during the night, when the radiation from the earth is sufficient to cause the deposition of water.

3rd. Green glass, which retards photographic action, likewise impedes this deposit.

In an experiment which is now going on, a bottle of pale green common glass is exposed to the north, while another of white glass is placed in a southern aspect. The first became covered with minute crystals, in size averaging about a millimeter, which have remained stationary for a week; the second is covered with arborescent ramifications, which are daily increasing.

Several familiar, but hitherto unexplained phenomena, may in my opinion be easily accounted for by these molecular actions.

The formation of hail I consider to be an instance of an action precisely similar to that which causes the deposition of the solids of gaseous and liquid particles. If we admit the influence of this force on the globular vapors of water, it is not at all improbable that certain conditions may arise in nature when these vapors may be much more liable to this influence than we find them in our imperfect experiments. We have seen that a solution of sulphate of soda or water in a pure state may be brought by the abstraction of caloric to such a condition of unstable equilibrium, that the slightest perturbating cause will immediately reduce them to a solid form.

If we admit that the globules which form the clouds are capable of being placed in a similar condition, we have sufficient data to explain all the phenomena that occur in the production of hail. Any nucleus formed within a cloud in this state, would create around it a deposition of all the neighboring particles; and the size of the hail-stones would be dependent upon the thickness of the cloud it had to traverse. In the storm at Ordenburgh, in 1825, mentioned by Dr. Eversman, pyrites was found in the centre, and had acted like a nucleus round which the crystalization had taken place. Where the centre is not formed by a foreign body of this sort, it has frequently been mentioned that it consisted af an opake nucleus of a spongy nature, like congealed snow, which may be easily accounted for. The succession of concentric layers would be caused by the passage of the particles through strata of liquid globules not all at the same temperature; and the radiated structure indicates a gradual increase of crystaline action proceeding from the centre. The temperature of the hail-stones, which has generally been found below the freezing-point, is a further corroboration of this view.

The formation of butter is likewise in all probability another instance of molecular action of the same nature. It is well known that after the cream has been agitated for a certain length of time, the globules suddenly coalesce, and by their union butter is produced. The sudden appearance of this product is the more remarkable, as it takes place at different temperatures, although more quickly at some than others,

and not gradually, as might have been expected, which precludes the idea of its being owing to any caloric developed by friction. The most minute observations have been unable to show any material alteration in the appearance of the fatty globules at the moment before the butter is formed. Little doubt can be entertained of its being caused by some molecular action, or engendered in the globules by the continued agitation they have undergone.

Some of the most permanent gases likewise exhibit phenomena closely allied to the above, by their action on platinum and other metals. According to Dulong and Thenard, platinum foil newly beaten has the property of acting at the common temperature, on a mixture of hydrogen and oxygen; but after a few minutes' exposure to the air, it entirely loses that power, which may however be restored to it in a stronger degree than before by heating it in a covered crucible. If it be kept in a covered vessel, so as to exclude the air, it will retain the power without decrease for four-and-twenty hours.

Platinum filings, made with an ordinary sized file, have the same property immediately after their formation, and which they retain for above an hour. It has also been observed, that a hollow ball of platinum has the power of condensing and absorbing different gases, which are generally disengaged at a temperature below the boiling-point (Pouillet, *Elemens de Physique*, § 131). The action of the gases on platinum in all the above cases greatly resembles that of carbonic acid on glass, except that not merely simple lines, but the whole surface of the metal exerts its influence, and that the gases themselves are invisible. —*Phil. Mag. S.* 3 Vol. 28. No. 185. *Feb.* 1846.

LIGHTS AND SHADOWS OF DAGUERREAN LIFE.

NO. TWO.—BY GABRIEL HARRISON.

The day was beautiful, just such a day as would bring plenty of customers for pictures; and before I had my bath heated, Charles gave orders for a medium picture.

"Sit down, Sir—I will have a plate ready in a few moments—"

"How do you like your picture?"

"Very well; must I wait long before it will be finished?"

"In ten minutes, sir, you will receive it in the gallery."

Again Charles announces—"a quarter group of a lady and child."

"How old is the child, Charles?"

"About three months."

"Oh, torment!—however, send them up."

"Does the picture please you, madam?"

"Yes sir, I did not expect to get so good a one of the child."

And so the day went on, with order after order for pictures, succeeding each other so rapidly that it was late in the afternoon, when nearly worked to death, I sank down on the sofa with hopes of no more sitters, and a few moment's repose. But how frail a thing is hope! The gall of disappointment! A painter whose pictures fade as he paints them,—for just at this moment, Charles opened the door saying—

"A picture of this Indian girl, for a bracelet."

Good heaven! what a beautiful creature! I was no longer weary. I was strong through amazement at her radiant charms, for

> "I never saw a form before
> Of such unrivalled loveliness;
> Nor one who was of earth, who wore
> The look of heaven upon her face!"

There she stood, so modest in her attire, so perfectly graceful in her attitude—her form so luxuriantly rounded and commanding—yet gently bending as unassuming as

a lily. No attempt, by dress, adornments, or perfumes, to captivate the senses—her hair plain—and, oh! that silken hair! black as the raven's plumage, flowing abundantly over her soft round shoulders of a golden hue, and her eyes of a deep hazel bright, but more beautiful than the stars of heaven. What a language they speak! What a soul they portray! Her forehead, too, looked like the abode of sweetest poetry; and her ruby lips, so expressive! A settled smile was on them, as if they could not wear any other expression, but would at once melt chill sorrow into warmest gladness. Her arms so delicately rounded—unadorned save by the large pearl beads that loosely encircled the exquisitely curved wrists; and her orange colored drapery rudely trimmed about its hem with red and white beads, beautifully relieved her finely shaped ankle and foot. Then her voice! the softest music could not compare with it, as—after repeated attempts to catch this glorious image, I failed entirely—she said;

"Be not discouraged! If not here, you will get my picture elsewhere."

Discouraged, I was indeed! I tried and tried again—it was useless. At length I said,—

"The sun is down, miss; I am very sorry I cannot get your picture. You came rather late, can you not return to-morrow?"

"No," she said, in a quiet tone, "I cannot return. Farewell, Sir," and she turned and left me.

By an irresistable impulse I started forward, saying to myself, "I must follow her. I am bewitched, enthralled!"

Down the stairs she glided with such a noiseless gentle step, that she seemed like some ideal vision, a thing of air.

She turnes the corner—but how is this! A creature of such transcendant beauty, and yet the people stop not to gaze upon her with wonder and astonishment! Can they have eyes to see, or any organ of sense, to let her pass unnoticed thus? Still I will follow her. She moves toward the Hoboken ferry. The ferry master takes no fare from her—she passes him unnoticed. Could he have seen her?—He takes mine readily. The boat is noiseless, and yet it swiftly glides over the dark green waters of old Hudson. On, on, to the Elysian fields—night comes on—no light above or around me, save a luminous star over *her* head—moving on as she moves, and darting to my feet a ray like a stray moonbeam, to show the path before me. But hold! she pauses; mighty powers! See old Weehawken hills and rocks open—rent asunder noiselessly at the mere motion of her hand, revealing a deep dark cavity in the earth fearful to behold. She enters—I pause. "Stay, stay," I exclaim; "my heart fails me—speak!"

> Fair girl! by whose simplicity
> My spirit has been won,
> From the stern earthliness of life
> As shadows fly the sun.

"Speak! whither wouldst thou lead me!"

"To a place of eternal light; where day is endless, and summer, blissful summer reigns, where thou canst accomplish—and where alone can be accomplished the perfection of your divine art."

"I understand you not, sweet maid."

"Helia is my name, Sir."

"Sweet Helia! you seem not of our earth, yet thou art on it, and in palpable form; gifted with such beauty, that I would leave all dearest to me on earth, to follow thee and feast my eyes on thine endless charms."

"'Tis well! Fear not, but follow, and I will guide thee safe."

She moves on;—but how changed the air! as if just wafted from frozen regions, or robbing the dead of the charnel atmosphere around them! And the place seems like a perfect *chaos*—endless in space! "Good heaven! have I passed that bourne from which no traveller returns? Good Helia, tell me where I am."

"In the mighty vault of the numberless dead. Thus they lived on earth, but for *earth's follies*, and died without *accomplishments*. They who would not feel *Religion*, nor *Music*, nor *Painting*, nor *Poetry*. They who would not see *Nature* nor *Nature's God*. They who found pleasure in torturing the *innocent*, and even raised tender flowers, but to crush them."

As she pronounced these words in a solemn tone, she glided on through the misty atmosphere, and with noiseless step. I followed, and replied,—

"The vault of death! How can that be? Where are the skeletons of those

once inhabitants of earth?" and she answered,

"*Nothing* in life, *nothing* in death; and each one composes a particle of the atmosphere of this barren, useless space we now pass through."

"But I see a faint glimmering of light yonder."

"Yes, it is the portals of eternal summer. The heavenly abode of the famed and good—the reward which all receive, who, while on earth, lived as created to live, performing some good toward the *Omnipotent*, and His *creatures*." Ah! as these words, tender as the silver ripple passing through banks girded with sweet scented flowers, fell from her ruby lips, what a magic spell was wrought around me!

> "Twas like the stealing
> Of summer winds through some wreathed shell,
> Each secret winding, each inmost feeling,
> Of all my soul, bent to its spell."

No more was the still clammy air of death around me. But an atmosphere, heaving with perfumes delicious, and light celestial—as if the *Lord* had just said—"Let there be light, and there was light."

She too, became more beautiful as I gazed upon her, oh, fair Helia!

> "The star that gems life's morning sky,
> Smiles sweetly o'er thee now,
> And flowers around thy pathway lie,
> And roses crown thy brow."

And now our pathway was over flowers, and roses crowned her brow! The light becoming brighter revealed to view ponderous gates and columns of agate; strange in architectural order, but wonderful in beauty. The tesselated steps that lead to the stupendous archway, are of mother-of-pearl—dazzling my eyes with its thousand varied tints. But even this splendor was gloomy compared to what my eyes beheld on passing 'neath the gateway studded with precious stones. The form of the place is now amphi-theatrical, walled in with clouds of purple and gold. Here and there can be seen, rolling up in volumes, dense silvered smoke from goblets of incense, exhaled by burning diamonds, and on either side, are numerous figures in various forms, both young and old, with costumes ancient and modern, and in positions, none are alike, but all their faces are beaming with rare intelligence. They seemed healthy in flesh and blood, but motionless, and looked like things living in death.

"This place," said good Helia, "is POSTERITY."

"There are none here," said she, "that you have seen in life, but many you may recognise by having seen their pictures."

"Yes; but tell me who may this be with his proud forehead, deep sunken eyes, and firm lips."

"That is PLATO, the great Athenian Philosopher, the disciple of SOCRATES, who sits on his right, and the master of DEMOSTHENES, DION, and the mighty ARISTOTLE, that group around him.

"Here too are many others that were great in life. There is VOLTAIRE—here, DANTE, TASSO, GOETHE, MILTON, DRYDEN, POPE, BYRON, and this, the great SHAKSPEARE — that powerful genius, which broke like a sudden sunburst upon the age which he adorned. You are no doubt familiar with his *Macbeth* and *Lear;*—his sweet *Ariel* and *Juliet*, *Hamlet* and a host of others, he fashioned to the very life."

Saying this, she was still moving on, but now she stops, and turning, says, "Behold your own countrymen! See FRANKLIN, the modern philosopher! He who played with fires of heaven, bringing the forked lightnings from their gloomy nativity—the thunder clouds—and making electricity subservient to the will of man as a toy is to the hands of a child."

"And this with a group of fifty-six around him is the immortal WASHINGTON.

> "Whose every battle field is holy ground,
> Which breathes of nations saved—not world's undone."

"The wreath that binds his brow, is not of the wild tansy, made purple with blood, and saturated with the tears of widows and orphans It is of the laurel,—ever green and fresh, plucked from the banks of Peneas, and placed upon his brow by the hands of a free people! This is ALSTON—the poet painter—who, by his masterly works, made his country grey-haired in art. And this is EDGAR A. POE. How beautiful was his genius! How divinely sweet were the tones of his poetic harp! Hear ye not his silver bells? How tenderly soft they jingle on the ear!"

"Oh stay, dear Helia, and here let me rest, and do homage at the shrine of my

country's glory, for my soul hath its content so absolute, that if it were now to die, it were now to be most happy."

"Nay, you forget that you have still my picture to take. Your time is short, and you must return to your earthly home, 'before the moon in russet mantle clad, walks o'er the dew of yon high eastern hills,' " and as I turned to obey, there appeared

"The living landscape fairer than the morn,
The summer clouds in shapes romantic rolled;
And those that edge the far off west, like gold.
The lake that sleeps in sunlight; yet impressed
With shapes more sweet than real, on its breast;
The bluey, fading hills, the silvery sea,
And every scene, of summer speaks to me."

For we had now passed through the vault of death, to posterity, and were now in the midst of that eternal day, that eternal summer she told me of, and the fairies seemed

"Dancing on the air,
In rings around,
While sweetly perfumed flowers
On every side abound."

And Helia, seated on a bank of mossy green, said, "Now take my picture."

"Your picture! why how can I, when I have no tools, no camera," and waving her hand, with accents soft she uttered,

"Shadows of beauty!
Shadows of Power!
Rise to your duty,
This is the hour."

and up rose before me a camera, inlaid with costly gems, tube of gold, lenses clear as air, and beautiful plate holders; for a camera stand three water lilies with their stems girded in the centre and spreading out triangularly.

"Indeed, these things are elegant! and now, what am I to do for plates, chemicals, &c?"

"Why, you have them at your side."

I turned and looked, and sure enough; there they were! For plates, large ebony leaves, soft and silvery; for cloth, to clean with, rose leaves; for ammonia, dew drops in a lily cup; for buffs, large mullen leaves; for rotten stone, farina—the powder from flowers; for coating boxes, stupendous tulip cups!

"And sure more lovely to behold,
Might nothing meet the wistful eye
Than crimson, fading into gold,
In streaks of fairest symmetry."

And as she pointed to them, she said,

"For chemicals, thou shalt have the *prismatic* drops from yon rainbow now over head

"———— bursting through
The scattering clouds,
Resting its bright base on the quivering blue
And waving like a banner free."

It moves toward me, and in another instant I am in the midst of its gaudy hues. How soon it fades away! but it has left the tulip cups filled with its sparkling. I have made the trial. I take the picture from the camera. Great heaven! as I live, I have daguerreotyped fair Helia in the natural colors! This is indeed the perfection of my art! Oh! swift as love on the wings of thought, let me fly back to earth, that I may begin to live. Nay, stay me not! Off with your hands! and in the struggle, I awoke from a *dream*.

"Our life is twofold: sleep hath its own world,
A boundary between the things misnamed
Death and existence: sleep hath its own world,
And a wild realm of wild reality,
And *dreams* in their development have breath,
And tears, and tortures, and the touch of joy;
——————————they become
A portion of ourselves as of our time,
And look like heralds of eternity;
They pass like spirits of the past,—they speak
Like sybils of the future."

From the London Art-Journal.

PHOTOGRAPHY ON GLASS.

BY ROBERT HUNT.

PHOTOGRAPHY advances steadily towards perfection. In 1839 the attention of the scientific world was called to a "*Process by which natural objects may be made to delineate themselves without the aid of the artist's pencil;*" and they deemed it of the utmost importance as a physical discovery. Nor were they deceived. From the suggestions naturally arising from so very interesting a fact, as that the solar rays, however weakened in intensity, were capable of producing chemical changes, in a longer or shorter space of time, we have discovered many remarkable facts connected with the influence of sunshine on the organic and inorganic states of matter, and arrived at a knowledge of the laws regulating some great natural phenomena, which were previously involved in obscurity.

At that time the public regarded the production of a faint, but delicate, *shadow* of an external object formed in a dark box by rays collected in the focus of a lenticular piece of glass, as the perfection of natural magic; but now we have presented to us sun-drawn pictures, as decided in their characters as any Sepia drawing comprehending the most minute detail and great breadth of effect. They have, however, still wanted the charm of ærial perspective; and as differently colored bodies radiate the chemically active principle with degrees of intensity which bear no relation to the luminous character, they have been defective as faithful transcripts of nature under all conditions. The first of these objections to Photographic pictures on paper appears to be now removed. All the productions obtained on glass plates which we have examined have their distances correctly preserved, and the magic of a "painted air" lends its sweet enchantment to the helliographic landscape. The second objection still exists, and until we find some sensitive body which shall be uniformly influenced by the rays proceeding from either a yellow or a blue surface, it must continue a defect in all photographic delineations.

In our Journals for May and August, 1848, we described the peculiarities of the most important Photographic processes on paper, and explained the difference between the *negative* picture—with lights and shades reversed—and the *positive* one copied from it, having its lights and shadows correct, as in nature. In copying from a negative on paper, the resulting Photograph always presented a certain woolliness and want of sharpness, which arose from the circumstance that the texture of the paper on which the negative picture was obtained, was copied, with the positive image to a greater or less extent, according to its want of transparency. By the use of glass plates which ensure perfect transparency where required, this defect is entirely overcome; and the Photographs copied from originals on glass possess a degree of sharpness, superadded to the beauties of the ordinary pictures which can scarcely be excelled.

The French have certainly taken the lead in bringing forward this recent improvement, but at the same time it is but justice to notice that glass plates were first used, and, to a certain extent, with success, by Sir John Herschel in 1839. Previously to describing the methods now employed, we shall give the processes as detailed by Herschel, believing that they will be found equally valuable, under some modifications, as the more recent methods of manipulation. The paper from which we quote will be found in the *Philosophical Transactions*, Part I., for 1840:—

"With a view to ascertain how far organic matter is indispensable to the rapid discoloration of argentine compounds, a process was tried which it may not be amiss to relate, as it issued in a new and very pretty variety of the Photographic Art. A solution of salt of extreme dilution was mixed with nitrate of silver, so dilute as to form a liquid only slightly milky. This was poured into a somewhat deep vessel, at the bottom of which lay horizontally a very *clean glass plate*. After many days, the greater part of the liquid was decanted off with a siphon tube, and the last portions were slowly and cautiously drained away, drop by drop, by a siphon composed of a few fibres of hemp, laid parallel, and

moistened, without twisting. The glass was not moved till quite dry, and was found coated with a pretty uniform film of chloride of silver, of delicate tenuity and chemical purity, which adhered with considerable force, and was very little sensible to light. On dropping on it a solution of nitrate of silver, however, and spreading it over, by inclining the plate to and fro (which it bore without disturbing the film of chloride), it became highly sensitive, although no organic matter could have been introduced with the nitrate, which was quite pure, nor could any, indeed, have been present, unless it be supposed to have emanated from the hempen filaments, which were barely in contact with the edge of the glass, and which were constantly abstracting matter from its surface in place of introducing new.

"Exposed in this state to the focus of a camera, with the glass towards the incident light, it became impressed with a remarkably well-defined negative picture, which was direct or reversed according as looked at from the front or the back. On pouring over this cautiously, by means of a pipette, a solution of hyposulphite of soda, the picture disappeared; but this was only while wet, for, on washing in pure soda and drying, it was restored and assumed the air of Daguerreotype when laid on a black ground, and still more so when smoked at the back, the silvered portions reflecting most light, so that its character had, in fact, changed from negative to positive. From such a picture (of course before smoking), I have found it practicable to take Photographic copies; and although I did not, in fact, succeed in attempting to thicken the film of silver, by connecting it, under a weak solution of that metal, with the reducing pole of a voltaic pile, the attempt afforded distinct indications of its practicability with patience and perseverance, as here and there over some small portions of the surface, the lights had assumed a full metallic brilliancy under this process. I would only mention further to those who may think this experiment worth repeating that all my attempts to secure a good result by *drying* the nitrate on the film of chloride have failed, the crystallisation of the salt disturbing the uniformity of the coating. To obtain delicate pictures the plate must be exposed wet, and when withdrawn, must immediately be plunged into water. The nitrate being thus abstracted, the plate may then be dried, in which state it is half-fixed, and is then ready for the hyposulphite. Such details of manipulation may appear minute, but they cannot be dispensed with in practice, and cost a great deal of time and trouble to discover."

Sir John Herschel then offers some remarks on the advantages offered by glass plates as the only effectual means of studying the habitudes of the sensitive Photographic preparations; he then proceeds:

"I find that glass coated with iodide of silver is much more sensitive than if similarly covered with the chloride, and that if both be washed with one and the same solution of nitrate, there is no comparison in respect of this valuable quality, the iodide being far superior, and, of course to be adopted in preference for use in the camera. It is, however, more difficult to fix the action of the hyposulphites on this compound of silver, being comparatively slow and feeble. When the glass is coated with bromide of silver, the action *per se* is very slow and feeble, and the discoloration ultimately produced far short of blackness; but when moistened with nitrate of silver, it is still more rapid than in the case of the iodide, turning quite black in the course of a very few seconds' exposure to sunshine. Plates of glass thus coated may be easily preserved for use in the camera, and have the advantage of being ready at a moment's notice, requiring nothing but a wash over with the nitrate, which may be delayed till the image is actually thrown on the plate and adjusted to the correct focus with all deliberation. The sensitive wash being then applied with a soft flat camel hair brush, the box may be closed and the picture impressed, after which it requires only to be thrown into water and dried in the dark to be rendered comparatively insensible, and may be finally mixed with hyposulphite of soda, which must be applied hot, its solvent power on the bromide being even less than on the iodide."

Experience enables us to add a few particulars of manipulation to these processes, by which they may be greatly improved. The film of chloride or other salt of silver thus formed, is exceedingly thin, and it becomes desirable, where the original negative picture is to be used, to print off positives.

Sir John Herschel has remarked, that we cannot allow the wash of nitrate of silver to dry upon the coating of chloride or iodine. If, however, we dip the glass, coated with any of these insoluble salts of silver, into a solution of the same salt as is employed to decompose the nitrate of silver in the first instance, and having removed it, allow all the surplus moisture to flow off by placing the plate nearly upright, we may then by washing it with a solution of the nitrate considerably thicken, and that with much uniformity, the sensitive layer on the glass.

Mr. Towson has employed glass plate prepared in this manner, with much success. The method he adopts is, to have a box the exact size of the glass plate, in the bottom of which is a small hole ; the glass is placed over the bottom, and the mixed solution is poured in. As the fluid slowly finds its way around the edges of the glass, it filters out, leaving the fine precipitate behind it on the surface of the plate ; by this means the operation of coating the glass is much quickened.

Experiments have been made with some success, to produce films of silver on glass plates by Drayton's silvering process, which has been already fully described in the *Art Journal*, Nov. 1848, and then, by acting on these metallic films with iodine or chlorine, to form adherent chlorides or iodides.

There are so many valuable points about these methods of experimenting, that although they have not hitherto been rendered available in practice, we feel certain they must become so as soon as proper care is directed to these forms of manipulation. The attention of the public being turned to the albuminised plates, and considerable discussion having arisen, from the circumstance that the patentee of the Calotype process is about to secure a new process, said also to be on glass, by a patent, we have been induced to give all the particulars connected with this new form of Photography with which we have become acquainted.

The most satisfactory mode of proceeding appears to be as follows—which is not exactly the plan adopted by either Niepce or Everard. The whites of two or three recently laid eggs are well beaten, and all the stringy, opaque portions taken out ; the fluid should then be allowed to stand until it is perfectly clear. Dissolve fifteen grains of iodide of potassium in about two tea-spoonfuls of a solution of good gelatine (isinglass), add this to the whites of the three eggs, again well beat together, and set the mixture aside to become clear. Take a perfectly flat piece of glass which is free of air bubbles and clean one surface by rubbing it with cotton and a few drops of spirits of wine ; then spread the albuminous mixture over the plate as uniformly as possible, and place the glass to rest upon one corner, so that the superflous fluid may flow off. By this means a very thin and uniform coating of albumen will be left on the glass plate, and it must be allowed to dry in a warm, but not hot place. In this condition the glass plates may be kept for use. To render them sensitive, take a solution of nitrate of silver, thirty grains to three fluid ounces of distilled water ; pour this solution into a flat dish, and, holding the glass plate by the edge, care being taken not to touch the albumen with the fingers, dip the prepared face into it ; the silver immediately combines with the iodine, and forms over the entire surface of the albumen a uniform layer of iodide of silver, the albumen at the same time contracting slightly from the action of the caustic salt of silver upon it. In this condition the plate may be placed in the camera, and the photographic image impressed. But if it is desired to render the plate more sensitive, it is the best practice to allow the plate to dry, and then give it a second wash of nitrate of silver combined with a few drops of gallic acid, or of the sulphate of iron ; the plate having remained in the camera the proper time—of this experience must be the guide—it is treated in precisely the same manner as if the picture was on paper. If the calotype form of manipulation be preferred, it is washed with the gallo-nitrate of silver. It must, however, be remembered that this process, though glass plates may be used, is still subject to the operation of the Patent in the Energiatype, and which has been shown to possess the property of developing pictures from surfaces prepared with any of the salts of silver, is, however, perfectly untrammelled, and may be employed by any one. The very sensitive process of Dr. Woods, the Catalysisotype, is also peculiarly applicable to these albuminised

glass plates, and we believe it will be found to be far more certain than it has proved to be on paper, and this process is also free from any patent restrictions. Whichever of these processes may be employed, the process of fixing is first to plunge the plate into clean water, and then to wash with a solution of the hyposulphite of soda.

We understand that several improvements upon the above methods, on glass, have already been effected by several gentlemen, some of them members of the Photographic club, which, however, they decline publishing until the period allowed for specifying the patent now sought shall have expired.

Our patent laws are in every respect adverse to the progress of improvement, and they really afford a very insufficient protection to an inventor, unless he is prepared to incur a large expenditure of money on law.

No person can for a moment object to any man, who has made a *bona fide* discovery of a useful process or object, endeavoring to secure to himself, the advantages which may arise from the public employing the same—this is strictly legitimate. But the false position in which all parties are placed by the present patent laws, is well shown by the case at present under discussion. A discovery is made in France, and very shortly after the publication of that discovery on the Continent, a patent for a new process of photography on glass plates is applied for. This may or not be a discovery by the applicant—we are assured that it is so in the present case. He is, however, allowed six months from the date of his application to the sealing of his patent, and six calendar months for enabling him to specify. The object of this is to enable the patentee to render his discovery as perfect as possible ; but it not unfrequently happens that the patentee reserves his right of specifying to the very last moment, that he may include within his specification every process, subjeet or matter—every information he may obtain privately or publicly, and thus secure a monopoly. The result of this is, a determination on the part of those gentlemen who have been active in improving the Photographic processes, to refrain from publishing anything until the specification of this patent is enrolled. Thus the public are prevented from receiving such information as many men of science and photographers would be but too ready to communicate, but fear to do so, lest they may have to incur the risk of a lawsuit, for using processes of their own discovery. It is not unusual for parties applying for a patent—not merely to state the materials employed in their process—but to include in their specifications every material that can be substituted for those they employ. Every man should be protected against any infringement of his right, if such an infringement can be shown to be merely a dishonest *substitution* of some one element for another ; but it is commonly attempted to speculate upon materials which may possibly answer the end desired, and, without having tried a single experiment, to include a long list of articles in the specification which the patentee never intends using, many of which he cannot employ, solely for the purpose of hampering investigation. This, we find upon inquiry, proves often a fatal mistake, a patent being more frequently declared to be invalid from claiming too much, than from any deficiency in the claim.

A reform of our patent laws is much to be desired ; the entire practice of the courts is unsatisfactory ; and many of the most experienced of our patent agents exclaim against the continued practical injustice to which real inventions are subjected.

Many of our best artists are now employing Photography with the greatest advantage in their studies. With a camera, rendered portable by many ingenious methods now adopted, the lover of Nature is enabled to select his subject, and by the delay of a few minutes only to carry off a transcript. This he can transfer to canvas at his leisure, preserving all the beauties arising from delicacy of detail and accuracy in the general result. Paper has presented many difficulties ; at the same time, as from its convenient portability, it has many advantages. Glass plates however, offer such a perfect transparency, and manipulation upon them will be found to be really so easy, that we doubt not they will be generally employed. From results we have seen we have no hesitation in predicting, that as soon as the patent law allow a free publication, we shall have to put

our readers in possession of many greatly simplified manipulatory processes by which pictures may be readily obtained far exceeding anything yet produced, either in England or on the Continent.

AUGUSTUS MORAND AND THE DAGUERREAN ART.

BY REV J. P. KIDDER.

According to an expressed intent of the "Photographic Art-Journal" its readers are in this number presented with a brief Biographical sketch of one who stands confessedly among the first in the now extensive list of Photographic artists.

Augustus Morand was among the very few who in its inception, hailed the advent of this new art with enthusiasm, grasping with welcoming hand the new record of Truth, as it traversed the broad Atlantic.

With the warmth of a kindred sentiment he began immediately experimenting and developing this infant conception of the beauty and power that had lived surrounding yet unknown to man, since the creation.

It is well known, that as late as 1839, Daguerre and Neipce had never yet been able to apply their discovery to the delineation of the human countenance. This development was left to the Western World, and beautifully has she fulfilled her destiny in promoting this wonderful art. To Professors Draper, Morse, Chilton and others, are we indebted for the successful application of Daguerre's discovery to the taking of portraits in this country, and it was with pleasure that Daguerre himself acknowledged the fact of the farther evolving of his own idea, by the "practical operative American mind."

The Portrait embellishing our present number will to the eye of those skilled in physiognomy, indicate a character whose love for the ideal would tempt him to the acquirement of an Artistic Profession. Indeed, the field of action opened before him by this new branch of art allured him from mercantile engagements to which his early life had been devoted, and gave him an opportunity for displaying all those high qualities which are essential to success in new and difficult undertakings. It is a task of no little difficulty in sketching a notice of one still dwelling in our midst, to give the just enconium without appearing to transcend the limits of propriety. It is our intention not to express more in this instance than the simple truth. Personal acquaintance with Mr. Morand fully justifies the expression of the deepest admiration for his qualities of heart and mind, and unquestionably, the purity of purpose which he brought to his investigation and practice, has been a prime element of success in his endeavor to promote the art of Photography.

His long course in the profession has by necessity closely associated his name and fame with the progress of the art itself, and his prosperity beneath the depressing influences of a feeble constitution and impaired health, and the consequent necessity of removal from his labors, affords abundant proof that he has not been unappreciated among us. Whenever as the result of long and tedious experiments Mr. M. has succeeded in accomplishing discoveries or improvements; abandoning the narrow minded wish of exclusive benefit, he has freely imparted to his brother artists the knowledge he had acquired. Many are the young experimenters who have received from him the most valuable information without price. To enlarged views and liberal feelings as well as to research and skill, we attribute the honorable position Mr. Morand at present occupies in the profession and before the public.

As early as 1840, with the aid of a camera and such other apparatus as could then be procured, he experimented long

One of the most interesting specimens and earnestly, in order to lessen the time of operation, and when it is remembered that from ten to fifteen minutes were then found necessary for the production of a picture, we may well perceive some of the difficulties to be here overcome—few persons have that command of muscle and nerve necessary to remain quiet the length of time then required by the process, and correc likenesses of children were almost wholly unattainable.

When we now assert Mr. Morand's power to produce the most harmonious and life-like miniatures, of exquisite finish, almost instantaneously, we may readily suppose that his investigations proved not in vain.

Another point of progress consisted in the use of blue glass as a medium to intercept or neutralize the transmission of the red and yellow rays of light, that were found so often to perplex the various experiments.

From the year 1841 until 1847 Mr. Morand had in constant use a frame so constructed and placed above the head of the sitter as not only to effect the desired object, but also to relieve the subject from the glare of light, so often even at the present time the subject of complaint. To Doctor Chilton, the eminent chemist, perhaps more than to any other persons connected with the art, was he indebted for various suggestions made during his frequent visits to his laboratory, which have by practical experiment led to such beautiful results as we now witness in Mr. Morand's daily practice as a Daguerrean artist.

About the time he first became interested in the Photographic art, it was his good fortune to make the acquaintance of the lamented "Inman." With this truly great artist, he made many interesting experiments in the effects of light and shade—both arriving at the conclusion, that the only light suitable for producing an artistic effect, was a "Sky Light," so constructed as to introduce the rays at an angle of about forty-five degrees, and removed from the sitter sufficiently far to preserve the middle tints, so seldom obtained in the ordinary way. Also to J. B. Stearns, Esq., the Secretary of the National Accademy of Design, with whom he also frequently experimented, was Mr. M. indebted for valuable suggestions in reference to position. In fact every spare moment was spent by him in the society of those who could in any way contribute to his thirst after knowledge. He remained for some time at the corner of Broadway and Chambers street, where the "Irving" House now stands, a place endeared to him by many cherished associations of a scientific and friendly character.

Mr. Morand has always avoided and disclaimed a position of antagonism with those laboring in the same vocation. The endeavor of the Phatographic Art-Journal to elevate the character of the profession, and to promote harmony and cooperation among those engaged in the same beautiful pursuit, was as truly gratifying to Mr. M. as to any other artist. The results of true and harmonious combinations may be proven in this department of Science and Art as well as in all other branches of industrial occupation.

The continued attention given by Mr. Morand to his experiments, to the neglect of active exercise, finally so impaired his health that a southern voyage was deemed by his medical advisers essential to his recovery

Circumstances favored the selection of South America as the place of his destination. In 1842 he embarked for Rio de Janeiro, taking with him the necessary apparatus to continue his experiments in a different atmosphere, with a different light and beneath a tropical sky.

Having letters of introduction to several of the most influential persons in Brazil, he was received with hospitable welcome. He had been in Rio but a short time when the emperor of Brazil, Don Pedro the 2nd. requested his presence at the palace to witness the operation of the art. For the space of nearly five months he was almost in constant attendance upon the Emperor, either in taking views of the beautiful scenery in the vicinity of the Imperial Residence at "San Cristovam," about four miles from the city, copying portraits in the Royal Gallery of Paintings, or in Daguerreotyping the Members of the Imperial Family at the Court of Brazil. He also took several likenesses of Donna Francisca the youngest sister of the Emperor, who is now the wife of the Prince De Joinville, son of the late Louis Philippe, King of the French.

perhaps ever produced by the Photographic art, was taken by Mr. Morand at Rio; it was the custom of the Emperor to visit, every Saturday morning, his Palace in the city. One of these occasions he conceived to be an excellent opportunity for producing a fine picture of the Emperor with his body guard and splendid equipage. Having prepared his plates at an early hour, he awaited their arrival.

At the usual time the guard drew near in advance of the Emperor's carriage; the instant it halted, and while the Emperor was in the act of stepping out of his carriage, Mr. M. exposed his plate and in a second of time, procured a picture truly beautiful.

The body guard composed of 40 horsemen, were with but one or two exceptions all perfect, also the "Major Domo" in the act of kneeling to kiss the Emperor's hand as he stepped from the carriage. The likeness of the Emperor himself was very correct.

The whole time consumed in taking, finishing, and framing the picture was less than forty minutes from the time he arrived at the Palace. The Emperor doubted the fact, until his attention was called to the carriage in the plate, when he immediately assented, for it was the one presented to him by Queen Victoria, and one that he had not used for several months previous. The Emperor was in raptures with the picture and ordered that it should be hung in the Imperial Gallery, where it now remains, a testimonial of the enterprise and skill of our American artist. Mr. M.'s studio was enriched by many views taken from the most beautiful sites around Rio de Janeiro—and but for feeble health, a complete Daguerrean Panorama would have been the result of his abode within the tropics.

The following from the Court Journal at Rio, gives somewhat of an idea of the opinion held of his merits, as an artist, even at that early period:

Joornal do Commercio, Rio Janeiro.—That able artist in Daguerreotype, Mr. Augustus Morand, from the United States, of whom we have had occasion to speak heretofore, has merited the honor of being called to the palace to take the portraits of his Imperial Majesty and of the august Princesses: also some views from the windows of the Palace at San Cristovam. We have seen also a beautiful copy of the portrait of the late Imperador Don Pedro I. (the founder of the Empire,) which hangs in the Reception Chamber of the Palace, we could not help admire the perfection of the copy.

In April of 1843 Mr. M. again set sail for his native place, having been disappointed in the expectation of recovering his health by an intertropical residence.

The voyage home had the happy effect of entirely restoring his health. Almost immediately after his return he commenced experimenting in order to reproduce pictures from Daguerreotype likenesses. In this he employed the process now termed Tithonotype by means of the electrotype. This process deposites on the surface of the original picture a second plate of copper, which when separated, presents a perfect counterpart of the original. The specimens he produced thus early elicited well merited praise for their beauty and accuracy of finish. Subsequently Mr. M. travelled in our Southern States for the benefit of his health. During his travels on the Mississippi, the Missouri and the Ohio Rivers, he labored for the advancement of his profession as indefatigably as before; visiting the rooms of all similarly engaged and exchanging courtesies with many a brother artist. Upon his return he made arrangements to commence operating at 132 Chatham-street, N. Y., where he still remains. An inspection of his arrangements will afford to the visitor the most ample testimony in favor of his continued perseverance and skill. The perfect working of the Daguerrean art depends upon so wide a field of culture, that the artist may well pause e'er he venture within the sacred vestibule as the exponent of all the mysteries of this beautiful discovery. So many contingencies have to be compassed by the thought of the operator, that a knowledge of chemistry—of optics—Natural Philosophy and the proper understanding of the intricate laws of taste—are equally essential to the successful education of an artist. These acquirements combined with uniform self-possession and a persevering kindness and courtesy of demeanor to high and low, have combined to give to Mr. Morand the position he so truly deserves as one among the first of his profession.

From Arthur's Home Gazette.

ARTISTS OF AMERICA.—JOHN J. AUDUBON.

BY C. W. WEBBER,
Author of "Old Hicks," "Shot in the Eye," &c., &c.

But let us contrast this glimpse of his latter life, when, laurelled and gray, he stood yet unbowed upon the very verge of "second childishness," with his own charmingly-simple account of his early life up, through all his infantile yearnings and struggles, to the period of manly accomplishment, failures, doubts, dejection, and final triumph. It is from his beautiful Preface to his Biography of Birds, and was written in March, 1831:—

"I received life and light in the New World. When I had hardly yet learned to walk, and to articulate those first words always so endearing to parents, the productions of Nature that lay spread all around, were constantly pointed out to me. They soon became my playmates; and before my ideas were sufficiently formed to enable me to estimate the difference between the azure tints of the sky, and the emerald hue of the bright foliage, I felt that an

intimacy with them, not consisting of friendship merely, but bordering on phrenzy, must accompany my steps through life;—and now, more than ever, am I persuaded of the power of those early impressions. They laid such hold upon me, that, when removed from the woods, the prairies, and the brooks, or shut up from the view of the wide Atlantic, I experienced none of those pleasures most congenial to my mind. None but ærial companions suited my fancy. No roof seemed so secure to me as that formed of the dense foliage under which the feathered tribes were seen to resort, or the caves and fissures of the massy rocks to which the dark-winged Cormorant and the Curlew retired to rest, or to protect themselves from the fury of the tempest. My father generally accompanied my steps, procured birds and flowers for me with great eagerness,—pointed out the elegant movements of the former, the beauty and softness of their plumage, the manifestations of their pleasure or sense of danger—and the always perfect forms and splendid attire of the latter. My valued preceptor would then speak of the departure and return of birds with the seasons, would describe their haunts, and more wonderful than all, their change of livery; thus exciting me to study them, and to raise my mind toward their great Creator.

"A vivid pleasure shone upon those days of my early youth, attended with a calmness of feeling, that seldom failed to rivet my attention for hours, whilst I gazed in ecstacy upon the pearly and shining eggs, as they lay imbedded in the softest down, or among dried leaves and twigs, or were exposed upon the burning sand or weather-beaten rock of our Atlantic shores. I was taught to look upon them as flowers yet in the bud. I watched their opening, to see how Nature had provided each different species with eyes, either open at birth, or closed for some time after; to trace the slow progress of the young birds toward perfection, or admire the celerity with which some of them, while yet unfledged, removed themselves from danger to security.

"I grew up, and my wishes grew with my form. These wishes, kind reader, were for the entire possession of all that I saw. I was fervently desirous of becoming acquainted with Nature. For many years, however, I was sadly disappointed, and for ever, doubtless, must I have desires that cannot be gratified. The moment a bird was dead, however beautiful it had been when in life, the pleasure arising from the possession of it became blunted; and although the greatest cares were bestowed on endeavors to preserve the appearance of nature, I looked upon its vesture as more than sullied, as requiring constant attention and repeated mendings, while, after all, it could no longer be said to be fresh from the hands of its Maker. I wished to possess all the productions of nature, but I wished life with them. This was impossible. Then what was to be done? I turned to my father, and made known to him my disappointment and anxiety. He produced a book of *Illustrations*. A new life ran in my veins. I turned over the leaves with avidity; and although what I saw was not what I longed for, it gave me a desire to copy Nature. To Nature I went, and tried to imitate her, as in the days of my childhood I had tried to raise myself from the ground and stand erect, before Nature had imparted the vigor necessary for the success of such an undertaking.

"How sorely disappointed did I feel for many years, when I saw that my productions were worse than those which I ventured (perhaps in silence) to regard as bad, in the book given me by my father! My pencil gave birth to a family of cripples. So maimed were most of them, that they resembled the mangled corpses on a field of battle, compared with the integrity of living men. These difficulties and disappointments irritated me, but never for a moment destroyed the desire of obtaining perfect representations of nature. The worse my drawings were, the more beautiful did I see the originals. To have been torn from the study would have been as death to me. My time was entirely occupied with it. I produced hundreds of these rude sketches annually; and for a long time, at my request, they made bonfires on the anniversaries of my birth-day.

"Patiently and with industry, did I apply myself to study, for although I felt the impossibility of giving life to my productions, I did not abandon the idea of representing nature. Many plans were successively adopted, many masters guided my hand. At the age of seventeen, when I returned from France, whither I had gone

to receive the rudiments of my education, my drawings had assumed a form. DAVID had guided my hand in tracing objects of large size. Eyes and noses belonging to the giants, and heads of horses represented in ancient sculpture, were my models. These, although fit subjects for men intent on pursuing the higher branches of the art, were immediately laid aside by me. I returned to the woods of the New World with fresh ardor, and commenced a collection of drawings, which I henceforth continued, and which is now publishing, under the title of 'THE BIRDS OF AMERICA.'

* * * * * *

"In Pennsylvania, a beautiful State, almost central on the line of our Atlantic shores, my father, in his desire of proving my friend through life, gave me what Americans call a beautiful 'plantation,' refreshed during the summer heats by the waters of the Schuylkill river, and traversed by a creek named Perkioming. Its fine woodlands, its extensive fields, its hills crowned with evergreens, offered many subjects to my pencil. It was there that I commenced my simple and agreeable studies, with as little concern about the future as if the world had been made for me. My rambles invariably commenced at break of day; and to return wet with dew, and bearing a feathered prize, was, and ever will be, the highest enjoyment for which I have been fitted.

"Yet think not, reader, that the enthusiasm which I felt for my favorite pursuits was a barrier opposed to the admission of gentler sentiments. Nature, which had turned my young mind toward the bird and the flower, soon proved her influence upon my heart. Be it enough to say, that the object of my passion has long since blessed me with the name of husband. And let us return, for who cares to listen to the love-tale of a naturalist, whose feelings may be supposed to be as light as the feathers which he delineates!

"For a period of nearly twenty years, my life was a succession of vicissitudes. I tried various branches of commerce, but they all proved unprofitable, doubtless because my whole mind was ever filled with my passion for rambling and admiring those objects of nature from which alone I received the purest gratification. I had to struggle against the will of all who at that period called themselves my friends. I must here, however, except my wife and children. The remarks of my other friends irritated me beyond endurance, and, breaking through all bonds, I gave myself entirely up to my pursuits. Any one unacquainted with the extraordinary desire which I then felt of seeing and judging for myself, would doubtless have pronounced me callous to every sense of duty, and regardless of every interest. I undertook long and tedious journeys, ransacked the woods, the lakes, the prairies, and the shores of the Atlantic. Years were spent away from my family. Yet, reader, will you believe it, I had no other object in view, than simply to enjoy the sight of nature. Never for a moment did I conceive the hope of becoming in any degree useful to my kind, until I accidentally formed acquaintance with the PRINCE of MUSIGNANO, at Philadelphia, to which place I went, with the view of proceeding eastward along the coast." * *

In April, 1824, he sought for patronage in Philadelphia, and failing there went to New York with some better success; but weary and depressed, on the whole, he returned to nature for refreshing, and ascending that noble stream, the Hudson, glided over our broad lakes, to seek the wildest solitudes of the pathless and gloomy forests.

"It was in these forests that, for the first time I communed with myself as to the possible event of my visiting Europe again; and I began to fancy my work under the multiplying efforts of the graver. Happy days, and nights of pleasing dreams! I read over the catalogue of my collection, and thought how it might be possible for an unconnected and unaided individual like myself to accomplish the grand scheme.

"Eighteen months elapsed. I returned to my family, then in Louisiana, explored every portion of the vast woods around, and at last sailed towards the Old World. But before we visit the shores of hospitable England, I have the wish, good-natured reader, to give you some idea of my mode of executing the original drawings, from which the Illustrations have been taken; and I sincerely hope that the perusal of these lines may excite in you a desire minutely to examine them.

"Merely to say that each object of my Illustrations is of the size of nature, were too vague—for to many it might only con-

vey the idea that they are so, more or less, according as the eye of the delineator may have been more or less correct in measurement simply obtained through that medium; and of avoiding error in this respect I am particularly desirous. Not only is every object, as a whole of the natural size, but also every portion of each object. The compass aided me in its delineation, regulated and corrected each part, even to the very fore-shortening which now and then may be seen in the figures. The bill, the feet, the legs, the claws, the very feathers as they project one beyond another, have been accurately measured. The birds, almost all of them, were killed by myself, after I had examined their motions and habits, as much as the case admitted, and were regularly drawn on or near the spot where I procured them. The positions may, perhaps, in some instances, appear *outre;* but such supposed exaggerations can afford subject of criticism only to persons unacquainted with the feathered tribes; for believe me, nothing can be more transient or varied than the attitudes or positions of birds. The Heron when warming itself in the sun, will sometimes drop its wings several inches, as if they were dislocated; the Swan may often be seen floating with one foot extended from the body; and some Pigeons, you well know, turn quite over, when playing in the air. The flowers, plants, or portions of trees which are attached to the principal objects, have been chosen from amongst those in the vicinity of which the birds were found, and are not as some persons have thought, the trees or plants upon which they always feed or perch.

"An accident which happened to two hundred of my original drawings, nearly put a stop to my researches in ornithology. I shall relate it, merely to show you how far enthusiasm—for by no other name can I call the persevering zeal with which I labored—may enable the observer of nature to surmount the most disheartening obstacles. I left the village of Henderson, in Kentucky, situated on the bank of the Ohio, where I resided for several years, to proceed to Philadelphia on business. I looked to all my drawings before my departure, placed them carefully in a wooden box, and gave them in charge to a relative, with injunctions to see that no injury should happen to them. My absence was of several months; and when I returned, after having enjoyed the pleasures of home for a few days, I enquired after my box, and what I was pleased to call my treasure. The box was produced, and opened;—but, reader, feel for me—a pair of Norway rats had taken possession of the whole, and had reared a young family amongst the gnawed bits of paper, which, but a few months before, represented nearly a thousand inhabitants of the air! The burning heat which instantly rushed through my brain was too great to be endured, without affecting the whole of my nervous system. I slept not for several nights, and the days passed like days of oblivion,—until the animal powers being recalled into action, through the strength of my constitution, I took up my gun, my note-book, and my pencils, and went forth to the woods as gaily as if nothing had happened. I felt pleased that I might now make much better drawings than before, and, ere a period not exceeding three years had elapsed, I had my portfolio filled again.

"America being my country, and the principal pleasures of my life having been obtained there, I prepared to leave it with deep sorrow, after in vain trying to publish my Illustrations in the United States. In Philadelphia, Wilson's principal engraver, amongst others, gave it as his opinion to my friends, that my drawings could never be engraved. In New York, other difficulties presented themselves, which determined me to carry my collections to Europe.

"As I approached the coast of England, and for the first time beheld her fertile shores, the despondency of my spirits became very great. I knew not an individual in the country; and although I was the bearer of letters from American friends, and statesmen of great eminence, my situation appeared precarious in the extreme. I imagined that every individual whom I was about to meet, might be possessed of talents superior to those of any on our side of the Atlantic! Indeed, as I for the first time walked on the streets of Liverpool, my heart nearly failed me, for not a glance of sympathy did I meet in my wanderings, for two days. To the woods I could not betake myself, for there were none near."

Well received in England he passes through to Scotland.

Gallant and beautiful spirit! there was no need of woods for thee to hide! The noble work of Wilson had not long been finished then, and men were not done wondering at this glorious achievement of the Paisley weaver, who had left their own shores years ago, a poor and obscure adventurer for the forests of the New World, when another pilgrim from those far wildernesses, made his appearance amid the learned circles of the Scottish Capital. He carried a portfolio under his arm, and came, too, on an adventure to this seat of the mind's royalty and of voluptuous wealth. There was a look of nature's children about him. His curled and shining hair, thrown back from his open front, fell in dark clusters down his broad shoulders. Those bold features moulded after

"The high, old Roman fashion."—

those sharp, steady eyes, that straight figure and elastic tread, were a strange blending of the Red man and the pure blooded noble. A curious trader he! But, when his wondrous wares were all unfolded and spread out before their eyes, what a delicious thrilling of amazement and delight was felt through those fastidious circles! A gorgeous show! The heart of a virgin world unfolded—teeming with rare and exquisite thoughts—that had been born in the deep solitudes of her young musings, and thus caught by this weird enchanter's pencil, as they gleamed past in all the bright hues and airy graces of their fresh fleeting lives—with flower and tree, and rock and wave, as beautiful and new as if they were thrown in to make the fairy pageant real! It was a surprising revelation, and when they knew that it had all been the work—the obscure, unaided work, through years of enduriug toil—of that young wanderer, they were filled with overwhelming admiration. They loaded him with adulation and with honors; they took him by the hand generously, and led him up to his success.

Such was the effect of Audubon's appearance in Edinburgh. In that glorious portfolio men saw that a great creation lay folded; in that modest backwoodsman, they felt that one of the masterful spirits of the race of the olden time was amongst them, and they loved him, they nourished and they cherished his great enterprise. How could it be otherwise? There is, to cultivated souls, a compelling presence to genius, that will bear through its purpose in their love. But, to accompany him on his triumphal progress through Europe, the honored guest of princes and savans, would occupy space that might be far better employed in obtaining a nearer view of the man and the naturalist.

We may gather from his generous exhortation to younger naturalists to take the field, interesting features of what may be supposed to have been his own method of conducting his investigations when abroad with nature. Something of the sort of training by which his remarkable character was formed, and the modes and circumstances under which his works grew. After saying that the list of new species had been nearly doubled since the time of Alexander Wilsons's work, and that he felt confident very many species remain to be added by future observers, who shall traverse the vast wastes extending northward and westward from the Canadas, and along the western slopes of the Rocky Mountains, from Nootka to California; indeed, that he looks upon the whole range of those magnificent mountains as being yet unexplored—he addresses the young enthusiast:—

"Therefore, I would strongly advise you to make up your mind, shoulder your gun, muster all your spirits, and start in search of the interesting unknown, of which I greatly regret I can no more go in pursuit—not for want of will, but of the vigor and elasticity necessary for so arduous an enterprise. Should you agree to undertake the task, and prove fortunate enough to return full of knowledge, laden with objects new and rare, be pleased when you publish your work, to place my name in the list of subscribers, and be assured that I will not leave you in the lurch.

"Now supposing that you are in full ardor and ready to proceed; allow me to offer you a little advice. Leave nothing to memory, but note down all your observations with *ink*, not with a black-lead pencil, and keep in mind that the more particulars you write at the time, the more you will recollect afterwards. Work not at night but anticipate the morning dawn, and never think, for an instant, about the difficulties of ransacking the woods, the

shores, or the barren grounds, nor be vexed when you have traversed a few hundred miles of country without finding a single new species. It may, indeed it not unfrequently happens, that after days or even weeks of fruitless search, one enters a grove, or comes upon a pond, or forces his way through the tall grass of a prairie, and suddenly meets with several objects all new, all beautiful and perhaps all suited to the palate. Then how delightful will be your feelings, and how marvelously all fatigue will vanish. Think, for instance, that you are on one of the declivities of the Rocky Mountains, with shaggy and abrupt banks on each side of you, while the naked cliffs tower high over head, as if with the wish to reach the sky. Your trusty gun has brought to the ground a most splendid 'American Pheasant' weighing fully two pounds! What a treat! You have been surprised at the length of its tail; you have taken the precise measurement of all its parts, and given a brief description of it. Have you read this twice and corrected errors and deficiencies? 'Yes,' you say. Very well; now you have begun your drawing of this precious bird. Ah! you have finished it. Now then, you skin the beautiful creature, and you are pleased to find it plump and fat. You have, I find, studied comparative anatomy under my friend, Macgillivray, and at least, have finished your examination of the œsophagus, gizzard, cocca, trachæ, and bronchi. On the ignated clay casting of a buffalo you have laid the body, and it is now almost ready to satisfy the longing of your stomach, as it hisses in it oderous sap. The brook at your feet affords the very best drink that nature can supply, and I need not wish you better fare than that before you.

"Next morning you find yourself refreshed and re-invigorated, more ardent than ever, for sucess fails not to excite the desire of those who have entered upon the study of nature. You have packed your bird's skin flat in your box, rolled up your drawing round those previously made, and now, day after day, you push through thick and thin, sometimes with success, and sometimes without; but you at last return with such a load on your shoulders as I have often carried on mine. Having once more reached the settlements, you relieve your tired limbs by mounting a horse and at length gaining a city, find means of publishing the results of your journey."

It requires very little exertion of fancy to see in this a felicitous sketch of his own mode of "ransacking the woods, the shores, and the barren grounds."

Hear, too, this fine expression of the agonized travail of genius in the production of its mighty works. It is from the introduction to his fifth and concluding volume of the "Ornitholigical Biography."

"How often have I longed to see the day on which my labors should be brought to an end! Many times, when I had laid myself down in the deepest recesses of the Western forest, have I been suddenly awakened by the apparition of dismal prospects that have presented themselves to my mind. Now sickness, methought, had seized me with burning hands, and hurried me away, in spite of all fond wishes, from those wild woods in which I had so long lingered to increase my knowledge of the objects they presented to my view.

"Poverty, too, at times, walked hand in hand with me, and on more than one occasion, urged me to cast away my pencils, destroy my drawings, abandon my journals, change my ideas and return to the world. At other times, the red Indian, erect and bold, tortured my ears with horrible yells, and threatened to put an end to my existence, or white-skinned murderers aimed their rifles at me. Snakes, loathsome and venomous, entwined my limbs, while vultures, lean and ravenous, looked on with impatience. Once, too, I dreamed, when asleep on a sand bar on one of the Florida Keys, that a huge shark had me in his jaws, and was dragging me into the deep.

"But my thoughts were not always of this nature—for, at other times my dreams presented pleasing images. The sky was serene, the air perfumed, and thousands of melodious notes from birds, all unknown to me, urged me to rise and go in pursuit of those beautiful and happy creatures. Then I would find myself furnished with large and powerful wings, and cleaving the air like an eagle, I would fly, and by a few joyous bounds overtake the objects of my desire. At other times I was gladdened by the sight of my beloved family, seated by their cheerful fire, and anticipating the delight which they would experience on my return. The glorious sun would rise, and

as its first rays illuminated the earth, I would cheer myself with the pleasing prospect of the happy termination of my labors and hear in fancy the praises which kind friends would freely accord. Many times, indeed, have such thought enlivened my spirits; and now the task is accomplished. In health and in sickness, in adversity and prosperity, in Summer and Winter, amidst the cheers of friends and the scowls of foes I have depicted the birds of America, and studied their habits as they roamed at large in their peculiar haunts"

That concluding passage is far nobler than "*veni vidi vici!*" as the simple expression of a proud triumphant consciousness; for instead of the intense egotism which renders that repulsive as it is celebrated, this is modest and severely classic. What a day that was when he could say, "I find my journeys all finished, my anxieties vanished, my mission accomplished! What a magnificent perspective could he look back through, down the past, more glorious than all royalties, than any heritage of earthly promises—and all his own! That day has now come in the fulness of time—and, glorious old man, thy mission is indeed accomplished!

ON DIFFERENT PROPERTIES OF SOLAR RADIATIONS.

Producing or preventing a deposit of Mercury on Silver Plates coated with Iodine, or its compounds with Bromine or Chlorine, modified by Colored Glass Media and the Vapors of the Atmosphere.

BY A. CLAUDET, ESQ.

FROM the commencement of photography it has been known that the red, orange, and yellow rays exert but a very feeble photogenic influence on the Daguerreotype plate. The experiments of several philosophers, especially those of Sir J. Herschel on photogenic papers, published in February 1840, prove that this action is more particularly confined to the most refrangible part of the prismatic spectrum, commencing from the space found covered by the blue rays and extending to the extremity of the violet, and sometimes even beyond it.

In 1839, Sir John Herschel observed that the red rays exercised on several photogenic papers an antagonistic action to the photogenic rays, modifying their effect. Contrary to this, in 1841, M. Ed. Becquerel presented to the Paris Academy of Sciences a memoir, in which he announced that the red, orange and yellow rays were endowed with the property of continuing the action commenced by the photogenic rays; these latter he called *exciting rays;* to the first he gave the name of *continuing rays.*

M. Ed. Becquerel made his experiments on photogenic papers, and added that he had observed the same effects on the iodized silver plate.

Dr. Draper of New York published in the Philosophical Magazine for November 1842, some remarks on a class of rays which he supposed to exist in the light of the brilliant sun of Virginia, and which had the property, when separated, of entirely suspending the action of the diffused light from the sky; these antagonistic rays extended from the blue to the extremity of the red, and appeared to be almost as active in preventing the decomposition of the iodide of silver as the blue rays were in producing it.

In January 1845, a memoir was read by me at the Society of Arts, London, in a part of which I recommended opticians to construct object-glasses in which they should particulaly correct the chromatic aberration of the long photogenic space of the

solar spectrum, even at the cost of the achromatism of the less refrangible rays. This, however, had been already indicated, without my being aware of it at the time, by Sir J. Herschel; but I added that the greater separation of the visual and photogenic focus which might result from such a combination, according to the quality of the glass employed, would be an advantage, by dispersing, at the focus or on the plate, beyond the photogenic lines, the red, orange or yellow rays; for the reason, that if they were brought to the same point they would tend to neutralize and destroy the effect of the photogenic rays.

In October 1846, M. Lerebours announced to the Paris Academy of Sciences that the red rays prevented the action of the photogenic rays; this announcement induced Messrs. Foucault and Fizeau to publish immediately similar results, which they had previously consigned to the Academy in a sealed memoir, bearing date May 1846.

These communications of Messrs Lerebours, Foucault, and Fizeau, led Dr. Draper to write a letter, published in the Philosophical Magazine of February last, repeating his observations on the spectrum of Virginia, adding several other analogous facts confirming the theory of a protecting and even destroying action exercised by the least refrangible rays. Dr. Draper, in the same letter, said that the rays which protect the plate from ordinary photogenic action are themselves capable, when isolated, of producing a peculiar photogenic effect.

Soon after the publication of M. Ed. Becquerel's memoir, M. Gaudin made some analogous researches on the Daguerreotype plate; and he succeeded in developing an image as perfect as that produced by mercury, by submitting the plate, when taken from the camera obscura, to the action of light alone under a yellow glass, and without any subsequent exposure to mercury.

This curious discovery gave some hopes that, from the supposed continuing action of the red and yellow glasses, by submitting the plate alternately, or simultaneously, to the action of the mercury and of these glasses, an accelerated development of the image would result; but all the researches made to arrive at this point have been fruitless; and, until the present time, the labors of Messrs. Becquerel and Gaudin have received no satisfactory explanation or useful application.

My own experiments, which are the object of this memoir, seem to prove that M. Ed. Becquerel was mistaken as regards the Daguerreotype plate, in so far as he attributed to the red, orange and yellow glasses, a continuing action of the effect of the photogenic rays.

In the Daguerreotype, when we speak of the *photogenic effect*, we cannot understand any other than that which gives to the surface an affinity for mercurial vapor.

In the case of photogenic papers, it is true that the red, orange, and yellow rays render the parts previously affected by the photogenic rays black or of a darker color. It is the same with the Daguerreotype plate, which after it has been feebly impressed, darkens rapidly to a violet color under the radiation of a red or yellow glass. This is the only continuing effect I have observed, and this effect is not *continuing* in a Daguerreotype sense, it has no relation to the property of attracting the mercurial vapor; on the contrary, it will be seen from the experiments which I am about to describe, that the radiations of red, orange and yellow glasses entirely destroy this property. There existst then a certain analogy between the action of the red, orange and yellow glasses upon the photogenic papers and the Daguerreotype plate; and thus continuing action is probably due to the distinct photogenic action possessed by these rays, as I am able to prove by facts of a very positive nature.

These two photogenic actions result from two different principles, nevertheless producing similar effects, as to the color obtained, on the iodide, bromide or chloride of silver, whether it be found isolated, as is the case on the photogenic paper, or it be found in the presence of metallic silver, as happens upon the Daguerreotype plate; but they produce quite an opposite effect upon the silver plate, whatever may be the color previously given to the surface by these two radiations, endowing it with a property, the one of attracting, the other of repelling the murcurial vapors. We must take care not to confound those two results; we can also conceive two different actions may be endowed with contrary

properties as regards the fixation of mercurial vapor.

The facts pointed out by M. Gaudin are the results of an action which does not belong to the Daguerreotype, since they are manifested without the aid of mercury; for we must not lose sight of the fact, that the production of the Daguerreotype image is due only to the affinity for mercury of the parts previously affected by the photogenic rays. It does not then follow from the production of an image without mercury, by crystallization or some peculiar arrangement of the molecules, that the red, orange, and yellow rays exert a continuing action analogous to that which determines the fixation of mercurial vapor.

Having examined with a prism the light transmitted through the glasses used in these experiments, I found that the red absorbs two-thirds of the prismatic spectrum, from the space covered by the green to the extremity of the violet, leaving the red, orange, and a little yellow, followed by a very slight trace of green. The orange glass gave more yellow, the green being more decided. The light yellow glass intercepted the half of the spectrum; the red was less intense than in the preceding; the yellow occupied two-thirds of its total length, and the green became very distinct; but as far as my sight allowed me to judge, I could not discover any portion of blue in either case: certainly in the spectrum of the red glass there was not the least trace of it.

I will now detail the series of observations I have made upon light transmitted through certain media—the vapors of the atmosphere, and red, orange, and yellow glasses. These experiments have brought forth some results which will I hope contribute to lay the foundation of a more complete theory of the photographic phenomena.

Having noticed, one densely foggy day, that the disc of the sun was of a deep red color, I directed my apparatus towards it. After ten seconds of exposure I put the prepared plate in the mercury box, and I obtained a round image perfectly black. The sun had produced no photogenic effect. In another experiment I left the plate operating for twenty minutes. The sun had passed over a certain space of the plate, and there resulted an image seven or eight times the sun's diameter in length: it was black throughout, so that it was evident, wherever the red disc of the sun had passed not only was there want of photogenic action, but the red rays had destroyed the effect produced previous to the sun's passage. I repeated these experiments during several days soccessively, operating with a sun of different tints of red and yellow. These different tints produced nearly the same effect: wherever the sun had passed there existed a black band.

I then operated in a different manner; not content with the slow motion of the sun, I moved the camera obscura from right to left, and *vica versa*, lowering it each time by means of a screw. In this manner the sun passed rapidly over five or six zones of the plate. Its passage was marked by long black bands of the diameter of the sun, whilst the intervals were white. It was then evident that the red and yellow rays, which alone were capable of piercing the fog, had destroyed the action produced by the little photogenic light which came from the zenith.

I then operated with colored glasses. After exposing a plate covered with a piece of black lace to daylight, I covered one half, and submitted the other to the radiation of a red glass, the mercury developed an image of the lace on the part which had been acted on only by the white light; the other, which had afterwards received the action of the red rays, remained black. The red glass had destroyed the photogenic effect in the same manner as it had been done by the red light of the sun.

I made the same experiment with orange and yellow glasses, and obtained analogous results, but in different times.

Then, having exposed a plate to daylight, I subsequently covered it with a piece of black lace, and exposed it again under a red glass; this produced a negative image. The red had destroyed the effect of the white light in the intervals of the lace, the threads of which preventing the action of the red glass, produced a white image upon a black ground. In operating in this manner upon one-half of the plate, exposing the other half covered only by the same lace to the light of the day, I obtained by the first a negative, and by the second a positive image. The orange and yellow glasses give the same result paying

regard to the difference of time in their respective actions.

All these experiments prove what has been already observed by others before me, but in a different manner, that the red, orange and yellow rays destroy the effect of the photogenic light, whether these rays be produced by the prism or by the action of colored media ; but I believe, it has not been observed by any one before me, that after the destruction of the photogenic effect the plate is perfectly restored to its former sensitiveness to white light.

After exposing a plate to daylight, and then submitting it to the destructive action of red, orange or yellow rays, it will be found again sensitive to the same white light.

I have obtained plates which present an equal and uniform image, although the one-half had been exposed to light, and then restored by the red, orange or yellow glass, while the other half had received only the single and final radiation. We may then expose a plate to light, destroy this effect by the action of red or yellow glass, which renders it again sensitive ; then expose it again to light, destroy this second effect by the same colored glass, and so on for many times, without changing the properties of the surface ; so that if we stop after any of the exposures to white light, the plate will receive mercury ; but if we stop after any of the exposures to red, orange or yellow light, we shall obtain no fixation of mercurial vapor.

Having exposed a plate to the two actions alternately, first, once upon one zone, twice upon another, and so on until the last zone had been exposed and destroyed six times, I covered the plate with a piece of black lace or an engraving, finally exposing the whole to white light ; the result was an equal deposit of mercury upon the whole surface of the plate. The impression of the lace or engraving seemed to be the result of a single exposition to light, as would have been the case with a normal plate ; therefore the action of the red, orange, or yellow glass, upon a plate previously affected by light, produces the same effect as a fresh exposure to the vapors of iodine or bromine, when we wish to restore the plate to its first sensitiveness.

This restoring property of the colored glasses may be of great use in the Daguerreotype manipulation. Instead of preparing the plates in the dark, it may be done with impunity in the open light. To give sensitiveness, we have only to place the plate for some minutes under a red glass before putting it in the camera obscura. The frame or box used to hold the plate, if furnished with a red glass at the bottom, will serve for this restoration. I have obtained in this manner images equal in effect to those produced on plates prepared in the dark.

This possibility of preparing plates in open day offers a great advantage to those who wish to take views or pictures abroad, and who cannot conveniently obtain a dark room. Again, in the case of a plate which has been left too long in the camera obscura, or accidentally exposed to the light, instead of rejecting it, we can restore its sensitiveness by placing it under a red glass. There is still another useful application of this property : if after one or two minutes' exposure to the mercury we perceive the image is too rapidly developing, or presenting signs of solarization, which a practised eye discovers before it is too much advanced, we have only to stop this accumulation of mercury by exposing the plate for a few seconds to the red light, and again place it in the mercury-box, to complete the modifications, which give the image all its tones and the most favorable tint. In truth, we may complete all the operations of the Daguerreotype in the open air, in the middle of a field if necessary. We can introduce the plate into the mercury box, in the same manner that we did in the camera obscura, by means of the same frame and red glass, which also serves to protect it when we take it from the mercury to rapidly view its development. I say rapidly, for if we expose it too long to the red light, the photogenic effect will be neutralized. We shall presently see that the time required to observe the state of the image is not sufficient to affect its affinity for mercury, if it be found requisite to replace it in the mercury box. The exposure under red glass necessary to destroy the effect produced by white light must be a hundred times longer than has been the exposure to white light, that of the orange glass fifty times, and that of the yellow glass only ten times ; thus a plate exposed to white light for a second will be restored to

its former sensitiveness in ten seconds by the yellow glass, in fifty by the orange, and in a hundred by the red. As soon as the sensitiveness of the plate affected by white light is restored by the colored glasses, it may be affected again by the photogenic light. It is not even necessary that the restoration should be complete; at each degree of restoration the plate is capable of receiving an accumulation of photogenic effect. If the red rays have not acted more than fifty times longer than the daylight, only half of the effect will be destroyed; if twenty-five times longer, one-fourth; and so on in proportion.

Besides the destructive action of the red, orange and yellow glasses, these same radiations are endowed with a photogenic power, that is to say, they have, like the blue and violet rays, the power of causing the fixation of mercurial vapor. Therefore these radiations are endowed with two contrary actions; the one destructive of the effect of the photogenic light, and the other analogous to the effeot of this light.

If the red, orange and yellow radiations of the prism had not also the power of operating photogenically, it might be supposed that this action of the colored glasses was due to some of the most refrangible rays transmitted by these colored media. But this cannot be; for if the photogenic action of the red, orange and yellow rays were the same as that of the more refrangible rays, it could never develope itself under the destructive action which the same glasses carry with them.

But there is yet more; each ray of the spectrum has its own photogenic action, and they are in this respect independent of each other, and of a different kind; so that the one cannot continue the effect commenced by the other, whether it be for the production or for the destruction of the photogenic effect. I would again observe, whenever I speak of a photogenic effect, I mean that which gives to the Daguerreotype plate the property of attracting the vapors of mercury.

If we expose a plate covered by an engraving to the red light 5000 times longer than is required to produce an effect by white light, we obtain by the fixation of mercury a feeble image, the lights of which are of a grey tone. I could never go beyond this feeble image, which appeared to be the maximum of effect for the red glass. It is impossible to attribute this effect to some feeble quantity of rays, properly called photogenic, passing through the colored glasses, for we have seen that the blue and violet rays cannot operate under the destructive action of the red rays; this fact proves then evidently, that if the red radiation has a photogenic effect, it cannot be due to the same principle which produces the photogenic effect of the rays situated at the other extremity of the spectrum. The yellow glass has also a peculiar photogenic action of its own, it is a hundred timess lower than that of white light, whilst its destructive action is not more than ten times as slow. We can obtain by the photogenic action of the yellow glass an image almost identical, as to force and color, with an image produced by daylight; with this difference, that the excess of action does not give the blue solarization which we observe upon plates strongly affected by daylight.

The different nature of the photogenic action of red, orange and yellow glasses from that of the daylight, is also proved by the fact, that the photogenic action produced by these colored glasses cannot be destroyed by their own reversing action, although the red will destroy the photogenic action of the yellow, and both of these will destroy the action of daylight.

The double property of producing and destroying a photogenic effect is manifested upon a specimen which offers on one-half of the plate a negative image and upon the other half a positive image, produced at the same time by the same radiation. The length of time necessary to operate with the red glass has not allowed me to obtain a good impression, but I have succeeded perfectly with the yellow glass. The experiment is especially beautiful, and has been thus made:—

I exposed one-half of the plate to daylight for one second, keeping the other half in the dark. The entire plate was then covered with an engraving and exposed under a light yellow glass during ten seconds for the part previously affected by white light, and during a hundred seconds for that which had been kept in the dark. The yellow glass destroyed on the first half the effect of the daylight wherever the plate was not protected by the black lines

of the engraving and the parts only which under these lines had been protected from the destructive action, received the mercury, producing a negative image; while the same radiation of the yellow glass had operated photogenically upon the other half, developing a positive image by the fixation of mercury upon the parts corresponding to the lights of the engraving.

Having exposed a plate with an engraving under the red glass for sixty minutes, I replaced the red by a yellow glass, without the engraving; after exposing the half of this plate for five minutes under this yellow glass, the other half being kept in the dark, the mercury produced a negative image on the half exposed to yellow light, while the other gave no trace of either positive or negative action. This result can only be explained in the following manner:

First. That sixty seconds had not sufficed for the apparent action of the red upon the half not exposed to the following radiation of the yellow glass.

Secondly. That nevertheless there had been the commencement of an action upon which the yellow glass had to exercise its destructive action.

Thirdly. That while the yellow glass was occupied in destroying the photogenic action of the red glass, restoring the surface to its primitive state, it was excercising a photogenic action upon the parts protected by the engraving from the red rays, and in five minutes this photogenic action of the yellow glass had produced a negative image by operating upon the shadows of the drawing.

It results from the experiments I have described, that the solar radiation, when modified by colored media, is in the Daguerreotype process endowed with several different photogenic actions, corresponding with various rays of the spectrum.

The various photogenic actions of the modified solar radiation have distinct characters; each of these modifications is endowed with a photogenic power peculiar to itself, and which gives an affinity for mercurial vapor to the Daguerreotype plate. These various actions are so different, that we cannot mix them artificially to assist each other, as they are antagonistic. The effect commenced by the blue rays is destroyed by the red and yellow; that which was produced by the red is destroyed by the yellow; the effect of the yellow rays is destroyed by the red; and the effect of the two latter is destroyed by the blue; each radiation destroys the effect of the others. Thus it appears that each radiation changes the state of the surface, and each change produces the sensitiveness to mercurial vapor when it does not exist, and destroys this sensitiveness when it does exist.

The alternate change of the state of the plate by these various radiations seems to prove that the chemical compound remains always the same under these different influences; that there is no separation or disengagement of the constituent elements.

If the blue radiation or white light liberates iodine or bromine, these elements would evaporate or combine with the silver surface immediately beneath. If we take the first idea, how comes it that the red radiation re-establishes the compound in its primitive proportions; and, in the second case, how does it happen that these rays are capable of decomposing the surface beneath, liberating the iodine or bromine, and then combining them again with the upper surface? It is impossible to admit that the red radiation is endowed at the same time with the property of separating and the property of reuniting the same elements. We must then attribute it to a particular force—electricity perhaps, which might accompany each radiation, and which, under the influence of the one, would act positively, and negatively under the other, without changing the chemical compound. In one case this influence would give the affinity for mercury, and in the other destroy it.

At all events, we must look for another explanation of the phenomenon than the one which has hitherto been received, viz. the decomposition of the iodide of silver by the action of light. It is true that light decomposes iodide of silver, forming a subiodide, but this seems to require a longer time than that during which the surface is endowed with the property of attracting the vapors of mercury. In fact, the last property is communicated nearly instantaneously, which is not the case for the decomposition of the iodide by the action of light.

GOSSIP.

The evidences of friendship and hearty co-operation which have met our labors, from Daguerreotypists throughout the country, in the establishment of the Photographic Art-Journal, are a source of infinite pleasure to us. It was with many misgivings as to our ultimate success that we entered upon our editorial career in the cause of Photography; but, thanks to the indulgence of Daguerreotypists, three short months have placed us beyond the possibility of failure, so far as pecuniary matters are concerned. We feel more than pleasure at this result; we are gratified beyond our most sanguine expectations, and shall continue to strive to retain the confidence and approbation so lavishly bestowed upon us by our subscribers.

To those who have not confined themselves to mere expressions of approval—always sweet food for ambition—for the course we have pursued in the Art-Journal, but have done us the honor of presenting testimonials of lasting remembrance, we would return our grateful thanks, assuring them that we shall prize their gifts, not only on account of their intrinsic value, but for the sentiments that dictated their bestowal. Above all, shall we cherish with deep feelings of pleasure the remembrance of the presentation of *that* gold pen—

> That instrument of mighty power—
> Charmer of many a lonely hour;
> Be thine the task to elevate the mind,
> Enlighten, bless and benefit mankind—

and the flattering sentiments accompanying it, for we know the heart of him who gave them, and feel and appreciate their value.

> Of all the gifts which heaven sends,
> The kindly sympathy of friends,
> Appeals more truly to the heart
> Than all earth's treasures can impart.

—We flatter ourselves that our readers will be pleased with our having secured the aid of Mr. Claudet in the conduct of our Journal, as will be seen by the following extracts from a long and interesting letter from him. Mr. Claudet's labors for the advancement of the Daguerrean art, and his high reputation as an artist, an author, and a gentleman, are already too well known in this country to need any farther encomiums from us. He will please accept our thanks for the liberal sentiments he expresses towards us, as well as for his communications, which shall appear in the Journal at the earliest date.

No. 18 King William-st., Strand.
London, 17th March, 1851.

H. Hunt Snelling, Esq.—Sir: I have received your letter of the 17th February, and am much pleased to hear that you have established a Journal on Photography.

* * * * * *

As an enthusiastic follower of the art, I cannot but feel a great satisfaction in thinking that henceforward new discoveries and improvements will be published as soon as they are made, and that the labors of photographers will not be isolated as they have been until now. This publicity will do much for the progress and advancement of the science.

I shall be most happy to be in correspondence with you, and to send you, now and then, information which may be interesting to your readers. * * * *

Yours, &c.,
(Signed) A. Claudet.

—Mr. G. Harrison communicates the following new method of using iodine, which is simple, yet of much importance to the practical operator.

Iodide of Lime.—To a half pint of dry lime—the same that is used for bromine—add half an ounce of dry iodine; shake them well up together until the whole is of a brownish tint; then spread the whole in your coating box and coat as usual.

For the last six weeks I have used iodine in this form, and unhesitatingly pronounce

it the best method that has come under my observation, for the following reasons:

1st. It coats the plates more evenly, especially the double whole plates—owing to the fact that the iodine being thoroughly intermingled with the lime, is beautifully distributed and prevented from being thrown about in the coating box.

2d. The airiform dampness, and sudden changes in the atmosphere, which very frequently effects iodine, thereby producing a thin bluish tone picture, is to a very great degree prevented, on account of the lime taking up the moisture before it can effect the iodine; and the alkali from the lime, which mingles with the iodine, has a tendency, as it ascends to coat the plate, to give a solidity to the tone of the picture, producing finer whites, and those positive high lights which are so essential to a fine daguerreotype.

I would advise operators to try this mode of using iodine, as I feel confident it will be preferred to any of the old systems. If the above proportions are not found sufficiently strong, more iodine may be added to the lime.

— The Whitened Camera.—We find in the last received number of the London Athenæum a letter from W. E. Kilburn, "Photographer to the Queen," on the subject of M. Blanquart Everard's new mode of using a whitened instead of a darkened camera in taking sun pictures. He says that he has, since seeing the notices of the new process, operated daily with a whitened camera "on every variety of subject," and he sends the Athenæum specimens of the results obtained. He adds:—"I suppose to a certain degree the opinion of M. Everard that his arrangement quickens the process, but not to the extent claimed by him—and, as a matter of course, it would assist in the formation of an image by light too feeble with the box blackened. I think it also of service in rendering very dark shadows less opaque."

Mr. Silas Selleck, of New York, informs us that he has for the last two years used the white lining to his camera box, and found it a great advantage in lessening the time, and far superior to the black lining for producing well defined and soft tone pictures. If the box has been already blackened, white paper may be used to cover the sides. The fact that Mr. Selleck has been using a whitened camera for so long a time without making it public, proves the force of our argument in our article on "Photographic Re-Unions," viz: that it is unwise to keep any discovery or improvement secret from selfish motives, as others might discover the same thing, and by publishing it, secure to themselves the honor absolutely due to the first discoverer. We, however, know Mr. Selleck well enough to answer for his not withholding this fact so long, from such motives, and can only attribute his silence on the subject to modesty or forgetfulness.

Mr. Selleck also informs us, that operators, particularly travelling artists, will find that much finer daguerreotypes will be produced by placing a piece of thin blue tissue paper between the picture and the mercury in the bath, in such a manner that the mercury vapor will have to pass through it to get to the plate. When this paper is used the mercury must be kept much hotter.

— We clip the following from Arthur's Home Gazette.

"There appeared in a late number of our paper, under the head of Scientific Memoranda, a notice of a very important improvement in the art of Daguerreotyping, made by Mr. H. W. Hayden, of Waterbury, Conn. In that notice rather more was claimed for Mr. Hayden than he professes to have discovered. We have received a communication from him on the subject, and will let him speak to the point himself.

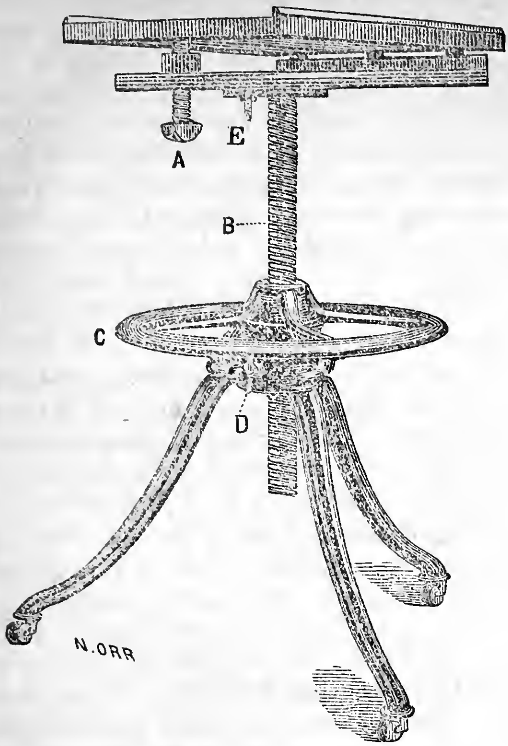
"'Your paper says that I can take any required number of landscape views with a common daguerreotype apparatus, *at the same instant*. This is rather more than I claim. I will state what my discovery is. I have discovered a process of taking the image produced by the camera, upon paper, in a few seconds, producing a *positive picture*, and by a single operation. No transferring. Exhibiting the effect of light and shade in the most beautiful manner, similar to a fine mezzotint engraving, and bringing out all the most delicate parts. Portraits and views can be taken with the same dispatch as the ordinary daguerreotype. As means are being taken for securing a patent, it would not be proper for me to describe the process at present.'"

—The following extract is so much in accordance with our views on a subject on which we were about to write, that we think we cannot do better than make them occupy the place of our own remarks. There is such a spirit of opposition to the Daguerrean art on the part of a certain class of men, that we deem every word, written in answer to their arguments to its disparagement, of importance.

"We trust that it may not be deemed out of place, if we venture to make a few remarks on the value of Photographic discoveries. Many pereons are still disposed to doubt their utility, and to ask, on all occasions, the question, *cui bono?* Independently of the extent to which we are justified in anticipating that it will spread, and the advantage which may accrue from future discoveries, even now its great value is, we believe, manifest. All men of reading desire to possess faithful representations of the monuments of antiquity—the Pyramids of Gizeh, the palaces or the temples of Ancient Greece and Rome. Every one must feel a pure and healthful pleasure in contemplating the representations of scenes made sacred to our memory by the deeds of heroes, or the words of sages. The temples of Athens, the wonderful Acropolis, the mysterious ruins of Pæstum, and the fanes and arches of Rome, proudly, but vainly named the eternal, speak even from their pictures. Theirs is the still small voice of the past speaking of the mutability of all things to the present. The lesson they thus give us, even those who have never crossed the sea which washes our island home, is but little inferior to that which the traveller receives who contemplates the moral of a crumbling arch or a broken column, on the very spots where once they stood the glory of the age. Even in our own land we have temples which realize, in their consistent and beautifully elaborate architectural details, the poet's fancy of a "petrified religion." We have monastic piles hastening to decay, but beautiful even in their dissolution, and baronial halls whose battlemented walls are tangled with the ivy and clothed with the moss of centuries; and these are hallowed by holy recollections which cling like the poetry of a pious superstition to every heart; and they cannot pass away until we have forgotten the history of our own land. Each and all of these we are now enabled to preserve in the strictest fidelity. Every stone will tell its own tale: and as the mind of the poet shines forever from his productions, so the very genius, the very spirit of the place, may now be impressed by the subtle fingers of light upon tablets of metal or sheets of paper, to speak to future ages as they speak to us. Again, by this wondrous science, we are now enabled to preserve and hand down to future generations the *truth-telling* portraits of our statesmen, our heroes, our philosophers, our poets, and our friends, with "all the mind, the music breathing through the face."

"But, independently of this practical utility, we have derived another advantage from the discoveries which have been made in this branch of science. We have been enabled to perceive and contemplate the beauty and harmony of those laws by which Divine Wisdom regulates and governs the universe. They have shown us that not a sunbeam can fall without producing a molecular or chemical change. They have taught us how close is the tie which exists between all the imponderables, light, heat, electricity, &c. They have proved to us how necessary to organic life, to the germination and growth of plants, the vitality and welfare of the animal creation, is that 'efflux divine,' of which it has been poetically and truly said that 'balm, and joy, and life is in its ray.'

"George Thomas Fisher."



DOAK'S CAMERA STAND.

The above engraving represents a new style of camera stand for the double whole size instrument, invented and manufactured by Mr. George Doak, 127 Anthony-st., New York. A glance at it is all that is required to convince any one of its superiority for the purpose for which it is intended. The instrument is elevated or depressed by means of the wheel C; through which the screw rod B passes. A, is the screw for inclining the camera box to the proper angle; D, the set screw for securing the instrument at the proper height: E, a thumb screw for fastening the top of the stand, which revolves on a pivot. Messrs. Gurney, Lawrence and Harrison, each use these stands, and pronounce them to be superior to any article of the kind in use. We are decidedly of the same opinion.

—THE HILLOTYPE.—The anxiety for the development of this new process is in no ways abating; but, on the contrary, increases each day, and we trust that Mr. Hill's health, which has suffered seriously from his close application to the discovery, will soon permit him to make those arrangements which are absolutely due to the public, and particularly so to the Daguerreotypists, who are already complaining of the injury the announcement is doing to their business. The knowledge of this discovery, we are convinced, should have been confined to the profession alone, until such time as Mr. Hill was prepared to treat for its publicity, and we must consider the injudicious course—undoubtedly adopted for pecuniary purposes by the party concerned—of blazoning it through the more public prints so prematurely, as highly reprehensible. We never contemplated such a result, and we feel sure that Mr. Hill could never have sanctioned the proceeding.

In order to meet the demands made upon him for a speedy development of his process, Mr. Hill has made an appeal to his Daguerrean brethren, to assist him pecuniarily by purchasing a new work on the Daguerreotype art which he is about to publish. We sincerely hope that there will be no hesitation on the part of the artists in the United States in purchasing this work, and thus rendering a service without any actual loss to themselves, as they will find the book, we doubt not, fully worth the price charged. The following is the title:

"PHOTOGRAPHIC RESEARCHES AND MANIPULATIONS; *including the substance of the author's treatise on Daguerreotype:* by L. L. HILL."

In his circular Mr. Hill says—"In offering this volume to the Daguerrean world, I present a full equivalent for the money charged. The book is the fruit of long experience in practice, and a familiar acquaintance with the best modes of operating employed by the best artists in our country. It is intended to pave the way for the successful practice of the new pro-

cess, at the same time that it is designed as the most reliable guide to Photographic Manipulation ever published. All irrelevant matter will be carefully excluded, and nothing but what is really valuable and practical will be presented. In this way I shall feel that I am a free man, and shall be able not only to complete my process, but to carry out my wishes in respect to the disposition of the rights. Those who favor me with their subscriptions will not only receive the full worth of their money in the book itself, but will have their names recorded where they will receive due attention when my discovery shall be ready for market. I have already satisfied myself that not every method of preparing plates, &c., will answer for the new process. The advantages of this volume, therefore, embracing as it does the methods employed by me as best adapted to the colored pictures, will be apparent, and this alone is regarded as a sufficient apology for the present step.

"Those ordering the book will do well to express their wishes in reference to the colors, and also to fix for themselves the *Post Office at which I may address them for some months to come.* In this way they will be sure to be notified in time to avail themselves of the new process."

Terms.—The book will be ready for the mail on the *first day of May;* and will in all cases be promptly sent on the receipt of orders.

Price three dollars, *always in advance.* All remittances at my risk, if enclosed in the presence of the Post Master.

Those ordering more than two copies may retain twenty per cent.

It is hoped that Stock dealers, and others, will order by the quantity.

All orders should be directed to L. L. Hill, *Westkill, Greene Co., N. Y.*.

Those who are disposèd to favor this undertaking, will oblige by sending their orders without delay. L. L. Hill.

Westkill, Greene Co., N.Y., Ap. 8, 1851.

We shall do ourselves the pleasure of noticing the work further when published.

— The History and Practice of the Art of Photography. *Third edition;* by H. H. Snelling: G. P. Putnam, 155 Broadway, publisher.

The rapid sale of this work has exhausted *two large* editions in as many years, and the fact that nearly one-fourth of the third is already disposed of is sufficient recommendation as to its excellence as an instructive and valuable acquisition to the Daguerreotypists library. This is the more apparent as we have not only sold several copies to the same Daguerreotypists, but have received, unsolicited, numerous highly valuable commendations from those who have purchased. Price, bound in cloth, $1,00. It may also be had of E. Anthony, 205 Broadway, John Roach, 79 Nassau street, N. Y., and all the principal Daguerreotype stock dealers in the United States.

— We made a flying visit to the national academy of design on the opening evening, and were delighted with the display of exquisite pictures which cover its walls. With a few exceptions, which should not have been permitted to exist, the exhibition of fine paintings far exceeds any thing of the kind submitted to the public for several years. We shall give critical notices of all the pictures of this large collection in future numbers of our Journal.

— In reply to H.'s communication, we would say: we send you a copy as a specimen; obtain one of the other, compare them and judge for yourself.

Mr. G—— need entertain no fears of the nature he mentions, notwithstanding the assertions of the person to whom he alludes. Our subscription list already pays the first year's expenses, and is increasing very rapidly; far beyond our most sanguine expectations.—We would refer our facetious friend to the fable of "*the Dog and the bone*," for a solution of his question. We think it peculiarly applicable to the instance to which he refers.

Lith. of F. D'Avignon 323 Broadway N.Y.

ENGRAVED EXPRESSLY FOR THE PHOTOGRAPHIC ART JOURNAL.

Geo S. Cook

THE

PHOTOGRAPHIC ART-JOURNAL.

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RESEARCHES ON LIGHT.*

BY ROBERT HUNT,
Secretary to the Royal Polytechnic Society.

PART I.
The influence of the Solar Rays on compound bodies, with especial reference to their Photographic application.

SECTION II.—*On the Action of the Solar Rays on Vegetable Substances.*

CHAPTER I.

Resins.

HELIOGRAPHY.—By this name M. Niepce distinguished, in 1827, the first process by which the images of the camera obscura were rendered permanent, after having impressed themselves upon prepared tablets. Although the process of the philosopher of Chalons is not likely to attract much attention from the photographer, who is now in possession of processes which infinitely surpass it in sensitiveness, yet, as it was the germ of every thing which has be en done in the art since that period, and as it develops some important operations of the solar rays, it could not be allowed to pass without especial notice. M. Niepce has given directions, which are essentially as follows — the process is given more in detail in the introduction.

Into a glass is put a small portion of asphaltum, upon which is dropped essential oil of lavender till the asphaltum is impregnated with it, and as much additional oil is added as will cover it to a slight depth. The mixture is then submitted to a gentle heat, until the whole of the essential oil is saturated with the coloring matter of the bitumen. A highly polished plate of silver is procured, and with a soft roll of skin some of this varnish is applied, in a very thin and equal coating; the plate is then placed upon heated iron, and when the varnish has ceased to simmer, it is withdrawn, and left to cool and dry in a gentle temperature, secured against any moisture. The plate thus prepared is placed in the camera, and in bright summer sunshine, a period of four or six hours is necessary to produce any thing like the proper effect. The images are exceedingly faint at first, but they are brought out by the action of a solvent which removes from the plate, or renders perfectly transparent, those parts upon which the solar rays have not acted. This solvent consisted of one part, by volume, of essential oil of lavender, poured upon ten parts, by measure also, of oil of white petroleum. The varnished tablet is placed in a proper vessel, which has been filled with the solvent, and the operator, by reflected Light, watches the development of the images, and removes the plate when the proper effect is produced.

The process is then completed, by placing the plate upon an inclined plane, and washing it with very clean water, to remove all the softened parts of the varnish which may still adhere to it. This varnish may be spread upon metal, glass, or stone. Engravings are more easily copied by this method, than pictures from nature can be procured.†

Niepce appears to have advanced this process considerably; but his partner in this inquiry, M. Daguerre, suggested the

* Continued from No. 4, page 208.

† See previous note in first No. of the Journal, where some of the subjects on these plates by M. Niepce himself are described.

use of materials by which the operation was greatly improved, as it regards sensitiveness and general effect. These improvements consisted in applying the residuum obtained by the evaporation of the essential oil of lavender to the plates, instead of the asphaltum; and instead of dipping the plate, after exposure, into a solvent, it is so placed that the *vapor* of petroleum acts upon it, by which the portions of the varnish that have been acted on by the Light is rendered transparent.

Daguerre remarks that all bitumens, all resins, and all residua of essential oils, are decomposable by Light in a very sensible degree. To exhibit this action, very thin coatings of them should be spread over fitting surfaces; and it is a curious fact, and well worthy the inquiry of chemists, that different solvents act differently upon these resinous plates after they have undergone the action of solarization. If alcohol is used, the parts on which the Light acted are dissolved off; but if an essential oil is employed, the parts in shadow are those effected by the solvent.

I have tried nearly all the gum resins in general found in the shops of druggists, &c., and these are, I find, acted upon in the same way as the pure resins, and indeed the gums give some indications of losing solubility by exposure to sunshine.

Guaiacum.—The color of this peculiar resin is yellowish brown, but upon exposure to the sun's rays it becomes green Dr. Wollaston first pointed out, that this change was brought on by the violet rays; that the original color was restored if it was exposed to the red rays, and that the same change was effected by the application of artificial heat.

Dr. Wollaston did not observe any change on exposing pieces of card, covered with an alcoholic solution of this gum, in the prismatic spectrum. But, taking a lens of seven inches in diameter, and having covered the central part of it, so that a ring of one-tenth of an inch only was left at its circumference, he could collect the rays of any color in a focus—the focus for yellow Light being 24½ inches. By this arrangement it was found, as above stated, that the violet and blue rays changed it to green; that the yellow rays produced no effect, and that in the red rays the *green color* was destroyed. When the guaiacum was placed in carbonic acid, it could not be rendered green at any distance from the lens, but was rapidly restored from green to yellow by the red rays. Thence he inferred that the rays of greatest refrangibility favor disoxygenation, but that the least refrangible ones favor oxygenation. These changes have been recently investigated by Sir John Herschel, the results of whose inquiries I shall now give.

This resin dissolved in alcohol, spread evenly upon paper, gives nearly a colorless ground. Exposed to the spectrum a blue color is impressed upon the paper, over the spaces between the least refrangible green rays, and a point situated upon the invisible rays a few lines beyond the violet rays. The action of dispersed Light changes the paper to a pale green, but over the region of the red rays the original pale color of the paper is preserved.

If a paper thus prepared is exposed to the action of Light, which has permeated a deep blue fluid, until it assumes a uniform pale blue tint, it will be found, that under the influence of the prismatic spectrum a restoration of the original yellow color takes place over the region of the green, yellow, orange, and red rays, the blue color being entirely removed by the orange ray. It will be remembered that Dr. Wollaston attributed this restoration of color to the action of heat. Had this been the true interpretation, we might expect to find the change most evident in that part of the spectrum where the heat was greatest, which we see is not the case.

Sir John Herschel exposed a portion of this paper to the action of chlorine considerably diluted with common air, by which it acquired a pale, dirty, greenish-yellow hue. Transferred immediately to the spectrum, it was impressed with faint tints nearly corresponding to the natural ones—the red was evident—the yellow dilute, and nearly white—the blue, a fine sky blue, while beyond the violet succeeded a train of somewhat greenish darkness.

If a paper prepared with the alcoholic solution of guaiacum, is placed in an aqueous solution of chlorine, it acquires a beautiful and pure celestial blue color. "This paper is very sensitive, and may be used for copying engravings, which it does with this singularity, that the picture penetrates the paper, and appears on the back with

nearly the same intensity as on the face." Under the influence of the less refrangible rays the blue color is changed into a pale reddish yellow, but simply whitened over the more refrangible region of the spectrum. Photographs or spectra received on this paper speedily fade. *(Herschel.)*

Several experiments were tried, with a view of determining if the conclusions arrived at by Dr. Wollaston, as to the influence of artificial heat in producing these changes of color were correct, and if they explained the restoration produced by the least refrangible rays of the solar spectrum. It has already been noticed that the rays of greatest calorific power produce no change upon the paper, whereas the decoloration is brought about by the rays in the region of the red, orange, yellow, and green spaces. It was found by Sir John Herschel that an artificial heat between the limits of 180° and 280° soon changed guaiacum from a green to a yellow state if moist, but that no such change was produced if absolutely dry. It was thought desirable to try the effect of the spectrum upon papers prepared as above, whilst, at the same time, they were subjected to a temperature sufficiently high to produce this effect had the paper been moist; this artificial heat being meant to assist the power of the calorific rays: this was done by holding a hot iron at the back of the paper. It was found, however, that, although it quickened the action over the luminous spaces, which were not at all changed in their character, that no perceptible effect was produced by those rays which possess the greatest heating power. From these researches of Sir John Herschel it would appear, that this restoration of guaiacum to its original color is not dependent upon the heating power of the sun's rays, but upon some influence strictly analogous to that exerted by the "chemical rays," but modified by the combined influences of Light and heat.

CHAPTER II.

Colors of Flowers.

The action of Light on the juices of plants has been carefully studied by M. Chevreul; but as his experiments were made with reference only to their permanence as dying materials, and with white Light as it proceeds from the sun, they afford no information as to the influence of the separated rays. This subject has alone engaged the attention of Sir John Herschel. The author has indeed tried a few experiments with the coloring matter of leaves; but for nearly the whole of the information contained in this chapter we are indebted to that distinguished philosopher.

Certain precautions are necessary in extracting the coloring matter of flowers. The petals of fresh flowers, carefully selected, are crushed to a pulp in a marble mortar, either alone or with the addition of a little alcohol, and the juice expressed by squeezing the pulp in a clean linen or cotton cloth. It is then to be spread on paper with a flat brush, and dried in the air without artificial heat. If alcohol be not added, the application on paper must be performed immediately, as the air, (even in a few minutes) irrecoverably changes or destroys their color. If alcohol be present, this change is much retarded, and in some cases is entirely prevented.

Most flowers give out their coloring matter to alcohol or water. Some, however, as the Escholzias and Calceolarias, refuse to do so, and require the addition of alkalies, others of acids, &c. Alcohol has, however, been found to enfeeble, and, in many cases, to discharge altogether these colors; but they are, in most cases, restored upon drying, when spread over paper. The juice of the *Viola tricolor*, extracted by alcohol, is a striking example of this temporary destruction of color. Papers tinged with vegetable colors must be kept perfectly dry and in darkness.

The color of a flower is by no means always, or usually, that which its expressed juice imparts to white paper. The red damask rose, called by florists the black rose, gives a dark slate blue, as do also the clove carnation and the black holyoak; and the common red poppy *(Papaver Rhœas)* imparts to paper a rich and most beautiful blue color. Sir John Herschel attributes these changes to the escape of carbonic acid in some cases; to a chemical alteration, depending on the absorption of oxygen, in others; and again in others, especially where the expressed juice coagulates on standing, to a loss of vitality, or disorganisation of the molecules. To secure an evenness of tint on paper, the fol-

lowing manipulation is recommended:—"The paper should be moistened at the back by sponging and blotting off. It should then be pinned on a board, the moist side downwards, so that two of its edges (suppose the right-hand and lower ones) shall project a little beyond those of the board. The board then being inclined twenty or thirty degrees to the horizon, the alcoholic tincture (mixed with a very little water, if the petals themselves be not very juicy) is to be applied with a brush in strokes from left to right, taking care *not to go* over the edges which rest on the board, but *to* pass clearly over those that project; and observing also to carry the tint from below upwards by quick sweeping strokes, leaving no dry spaces between them, but keeping up a continuity of wet spaces. When all is wet, cross them by another set of strokes from above downwards, so managing the brush as to leave no floating liquid on the paper. It must then be dried as quickly as possible over a stove, or in a current of warm air, avoiding, however, such heat as may injure the tint."

Before I proceed to give Sir John Herschel's remarks on the results of his inquiries, or offer any of my own, I shall mention, as briefly as is consistent with a correct understanding of the matter, several of the most remarkable results obtained by him upon vegetable juices, referring all those who may desire more detailed information to his memoir itself.*

Corchorus Japonica.—The flowers of this plant impart a fine yellow color to paper. Sir John Herschel says he has met with no vegetable color so sensitive. If the flowers are gathered in the height of their season, paper colored with them begins to discolor in ten or twelve minutes in clear sunshine, and in half an hour is completely whitened. The color seems to resist the first impression of the Light, as if by some remains of vitality, which being overcome, the tint gives way at once, and the discoloration, when commenced, goes on rapidly. *It does not even cease in the dark when once begun;* hence photographic images received upon papers prepared with this juice slowly fade out.

Prismatic Analysis.—Exposed to the spectrum, in about fifteen or twenty minutes the color is totally destroyed, and the paper whitened in the whole region of the green, blue, and violet rays, to which therefore, the most energetic action is confined. If the action of the spectrum be prolonged, a much feebler whitening becomes sensible in the red, and a trace of it also beyond the violet into the "lavender" rays. By keeping papers thus impressed, terminal spots were detected beyond the red extremity, and also beyond the violet, they having gradually developed themselves.

Common Ten-weeks' Stocks. — *Mathiola annua.* — The color imparted to alcohol by the double variety of this flower, in the height of its flowering, is a rich and florid rose red; when fresh prepared, papers stained with it are sensibly discolored in a few hours, and completely whitened in two or three days. Exposed to the spectrum, the rays chiefly active in operating the discoloration, are found to be those extending from the yellow to the less refrangible red, beyond which rays the action terminates abruptly. Above the yellow, it degrades rapidly to a minimum in the blue, beyond which it recovers somewhat, and attains a second but much feebler maximum in the violet rays.

Sulphurous acid whitens this paper, but it resumes its original color after a little time, which is materially quickened by the aid of Light. Papers thus completely discolored, when exposed to the spectrum, were restored to their original color, *by rays complementary to those which destroy it in the natural state of the paper;* the violet rays being chiefly active, the blue almost equally so, the green little, and the yellow, orange, and most refrangible red not at all. Sir John Herschel attributes, and I think rightly so, the power of the sulphurous acid in inducing a dormant state of the calorific principle to a partial deoxidisement, unaccompanied, however, with disorganisation of its molecules.

It has been noticed that alcohol in many cases weakens the colors of vegetable juices, and in some entirely masks them. With the *Papaver orientale* this is very strikingly shown. The color of the flower is a

* On the Action of the rays of the Solar Spectrum on Vegetable Colors, &c. "Philosophical Transactions, Part II. for 1842."

brilliant orange, "the coloring matter of which is only extractable by alcohol, and then only in a state so completely masked, as to impart no more than a faint yellowish or pinkish hue to paper, which it retains when thoroughly dry, and apparently during any length of time, without perceptible increase of tint." This paper is immediately rendered a vivid scarlet color when an acid is applied to it If paper covered with this alcoholic extraction is exposed for a long period to the influence of the Light, it undergoes some disorganization, so that, on being exposed to the vapors of muriatic acid, a dormant picture — supposing it to have been covered with an engraving — is gradually developed in a soft and pleasing style. The time required to produce these pictures extends over from twenty to thirty days.

Papers covered with an alcoholic tincture of *turmeric* are slowly acted upon. It is whitened by the blue and violet rays. If it is browned by carbonate of soda it is somewhat more sensitive, especially when wet, and an abruptly terminated action is perceptible in the red region. *(Herschel.)*

Bulbine bisulcata and two other species from the Cape of Good Hope were found by Sir John Herschel to yield from the green epidermis of their leaves and flower stalks a bright yellow juice, which darkens rapidly on exposure to Light, changing at the same time to a ruddy brown. Exposed to the spectrum, the less refrangible rays are found inoperative either in inducing a change of tint, or in preserving that portion of the paper on which they fall from the influence of dispersed Light. A darkening commences about the mean yellow ray, but it continues very feeble through the green ray, above which it darkens more strongly, arriving at its maximum in the blue, but extending to a considerable distance beyond the violet with some degree of intensity.

Cheiranthus cheiri, *Wallflower.*—" A cultivated double variety of the flower, remarkable for the purity of its bright yellow tint, and the abundance and duration of its flowers, yields a juice, when expressed with alcohol, from which subsides, on standing, a bright yellow finely divided fæcula, leaving a greenish-yellow transparent liquid, only slightly colored supernatant. The fæcula spreads well on paper, and is very sensitive to the action of Light, but appears at the same time to undergo a sort of chromatic analysis, and to comport itself as if composed of two very distinct coloring principles, very differently affected. The one on which the intensity and sub-orange tint of the color depends, is speedily destroyed, but the paper is not thereby fully whitened. A paler yellow remains as a residual tint, and this on continued exposure to Light, so far from diminishing in tone, slowly darkens to brown. Exposed to the spectrum, the paper is first speedily reduced nearly to whiteness in the region of the blue and violet rays. More slowly, an insulated solar image is whitened in the less refrangible portion of the red. The exposure continuing, a brown impression begins to be perceived in the midst of the white streak, which darkens very slowly over the region between the lower blue and the extreme violet rays. It never attains any great intensity, but presents a singular appearance in the midst of the white train previously eaten out."

The common *Marigold* yields an insoluble fæcula, which appears identical with that produced by the Wallflower and that of the *Corchorus japonica*, and it is found to be quite as sensitive to Light; but protographs procured upon it cannot be preserved, the color is so fugitive. The juice of the *Mimulus Smithii* affords a yellow die, which is similarly affected. "The *Ferrarea undulata*, a dark-brown flower, yields, when expressed, a dull green juice, which, spread on paper and dried, turns very speedily blue, under the influence of the blue and violet rays of the spectrum, owing to the destruction of this yellow principle, which, mingling with the substratum of blue (itself a much more indestructible tint), gives its natural tinge of green. The brown color of the French marigold, *Tagetes patula*, passes rapidly in sunshine from brown to green, probably from the destruction of the same yellow principle. And bees' wax it is well known, is bleached by Light, from the presence of a similar fugitive principle. (*Herschel.*)

The *Viola odorata* yields to alcohol a rich blue color, which it imparts in high perfection to paper. Exposed to sunshine it fades pretty rapidly, but a residual blue tint remains, which resists the action of Light for a long time, even for weeks.

When carbonate of soda is added to this solution it becomes green, and a slip of paper stained with this fluid, exposed to the spectrum is changed yellow under the orange and red rays; a slight discoloration is perceived in the indigo-blue rays, but not the slightest alteration under the green rays. The coloring matter of the purple iris shows this in a still more marked manner. In these instances the blue constituent of the green is destroyed by the solar rays. (*Herschel.*)

A variety of *Sparaxis* from the Cape of Good Hope gave to paper a dark olive-green color which was nearly insensible to Light. The addition of carbonate of soda changes this color to a good green, which is tolerably sensitive to solar influence. A photograph impressed on a paper prepared with it is reddened by muriatic acid fumes. If then transferred to an atmosphere of ammonia, and when supersaturated, the excess of alkali allowed to exhale, it is fixed, and of a dark-green color. (*Herschel.*)

The Red Poppy.—*Papaver Rhœas* yields a very beautiful red color, which is entirely destroyed by Light. When perfectly dried on paper the color becomes blue. This blue color is speedily discharged by exposure to the sun's rays, and papers prepared with it afford very interesting photographs. The purple juice of the *Senecio splendens*, the double purple groundsel, imparts a beautiful color to paper. It requires, however, an exposure of some weeks to daylight before the original whiteness is restored, which it at length is in the most perfect manner. (*Herschel.*)

The juices of the leaves of a great number of plants have been examined by the author; and the juices from leaves of the laurel, the vine, the common cabbage, and the grasses, have been found to be sufficiently sensitive, when spread upon paper, to give very good copies of engravings in an hour, provided the atmosphere was clear and the sun bright. The action of the prismatic spectrum upon those I have examined, agrees very nearly with results published by Sir John Herschel, as obtained upon the juice of the elder leaf. The red rays have a decided action, and give a ruddy yellow impression. It appears to me, this change is dependent upon the calorific agency merely, as similar changes are brought about by artificial heat. On the upper edge of the yellow ray, the space between the red and it being unaffected, a very faint image begins to be formed; this action goes on increasing up to the mean blue rays; it then declines, and ceases altogether within the limits of the visible violet ray.

From an examination of these admirable researches by Sir John Herschel on the coloring matters of plants, it will be seen that the action of the sun's rays is to destroy the color, effecting a "sort of chromatic analysis, in which two distinct elements of color are separated, by destroying the one and leaving the other outstanding." The action is confined within the visible spectrum, and thus a broad distinction is exhibited between the action of the sun's rays on vegetable juices and on argentine compounds, the latter being most sensibly affected by the "invisible rays" beyond the violet.

"It may also be observed, that the rays effective in destroying a given tint are in a great many cases, those whose union produces a color complementary to the tint destroyed, or, at least, one belonging to that class of colors to which such complementary tint may be referred. For example, yellows tending towards orange are destroyed with more energy by the blue rays; blues by the red, orange and yellow rays; purples and pinks by yellow and green rays."

I may here mention, that some very remarkable changes take place in the colors of many vegetable powders, in which we might least expect such alterations to occur. Experience has shown to the pharmacopolist the necessity of preserving the powdered leaves of the fox-glove, the hemlock, the henbane, the aconite, and other green vegetable powders of active medicinal powers, in the dark. It is found that these powders do not merely lose color, passing slowly from a green into a slaty grey, and ultimately into a dirty yellow, but they undergo some decomposition, by which, at the same time, they lose much of their medicinal activity, and indeed after a season they become nearly inert.

Few pharmaceutical articles suffer more in this respect than the powder of the jalap root; the ipecacuanha also loses much of its emetic power by exposure to Light. This is entirely independent of any action

of the air or moisture. I have observed these deteriorating influences on those powders, which have been kept in the most carefully closed bottles.

The powders of Cascarilla bark, of the Valerian root, and some others, particularly some of the varieties of rhubarb and the ginger root, are found to adhere with considerable firmness to the sides of the bottles next the Light, whereas the sides in shadow are left clear. I have also observed that a deposit will take in a similar manner on the sides of bottles containing some of the vegetable tinctures. This of course depends upon the same function which occasions camphor to be deposited in crystals upon the side of the glass next the Light, and maintains them there ; whereas if that side is turned from the Light, the crystals will be gradually removed and again deposited on those parts upon which the rays of Light first impinge. These phenomena must have been long and often observed, yet we have not any satisfactory explanation of them It does, however, appear, that we are advancing gradually towards the elucidation of these and many other matters which have often excited the wonder of observers without leading to any particular inquiry.

In bringing the first part of these researches to a conclusion, I cannot resist the temptation of calling attention to the great number of instances now adduced, in which we have distinct evidence of *chemical change* under the influence of the sun's rays. Those already mentioned appear quite sufficient to support me in the position I have long maintained, that the solar rays are continually acting upon matter—it signifies little in what form it may be presented to its influence. Although for photographic purposes we can only select those compounds which exist in a state of "tottering equilibrium," at least in the present state of our knowledge, yet we have distinct evidence, that a sunbeam cannot fall upon any solid body, without leaving permanent traces of its action. In the second part, these phenomena will be still further examined.

PART II.

The influence of the Solar Rays upon Vital Organisation, and upon simple organic bodies.

SECTION I. --*On the Vegetable Kingdom.*

CHAPTER I.

The Germination of Seeds, and the Growth of Plants.

THE surface of our earth is rendered beautiful, by the almost countless forms of vegetable life which adorn it. On the bare surface of the wind-beaten rock, the mysterious lichen finds a sufficient amount of those element which assimilate and form its structure, to support it through all the stages of its growth; and at length, having lived its season, it perishes, and in its decay forms a soil for the germination of plants, which stand a little higher in the scale of vegetable life. These again have their periods of growth, of maturity, and a dissolution ; and their disintegrated portions become the habitat of others, which pass through the same changes, until at length the once naked rock is covered with a garden, and the flowering shrub and the enduring tree wave in loveliness above it.

In a short time we find the almost microscopic seed, placed in a few grains of earth, springing into life, developing its branches, unfolding its leaves, and producing flowers and fruit; and although it has become a stately plant, we shall not discover much diminution of the soil from which it grew, and from which it would at first appear it derived all those solid matters of which its structure is composed. Experiments have been made in the most satisfactory manner, and it has been proved, that a very small amount only, of the soluble constituents of a soil are taken up by the roots of a plant ; we have then to look to other sources for the origin of the woody matter, of the acid and saccharine juices, of the gums and of the resins, yielded by the vegetable world. These are all, it will be found, formed by some mysterious modifications of a few elementary bodies, acted upon by the solar rays ; and

these are the phenomena which it is the business of this section to examine.

The condition necessary to germination are, moisture, a moderate temperature, and the presence of oxygen gas. The experiments of Ray, Boyle, Scheele, Achard, and Humboldt, all show that the presence of atmospheric air is necessary. Germination cannot take place at the freezing point of water, and at 212° all vitality is destroyed. If seeds are kept quite dry, they will not germinate, although the other conditions are fulfilled. All seeds do not germinate at the same seasons, some requiring a more elevated temperature than others, which fact explains the cause of the different periods at which we find the plants springing from the soil.

It has already been remarked, that Michellotti proved Light to be injurious to germination, and Ingenhouz and Sennebier found that seeds germinated more rapidly in the shade than in sunshine. This fact has been more recently established, beyond all doubt, by the author.

My investigations were first published in the Philosophical Magazine for April 1840, and they have, since that, been continued, grants having been made to the author by the British Association; and a report of the progress of the inquiry will be found in the report of the Association for 1842. It is necessary for a correct understanding of the results obtained, that all the conditions under which the experiments have been made should be distinctly stated.

Six boxes were so prepared, that air was freely admitted to the plants within them, without permitting the passage of any Light, except that which passed through the colored glasses with which they were covered.

These glasses permitted the permeation of the rays of Light in the following order:

1. A Ruby Glass, *colored with Oxide of Gold*. This glass permits the permeation of the ordinary red, and the extreme red rays only.

2. A Brown-Red Glass.—The extreme red ray appears shortened; the ordinary red ray, and the orange ray pass freely, above which the spectrum is sharply cut off.

3. Orange Glass.—The spectrum is shortened by the cutting off of the violet, indigo, and a considerable portion of the blue rays. The green ray is nearly absorbed in the yellow, which is considerably elongated. The whole of the least refrangible portion of the spectrum permeates this glass freely.

4. Yellow Glass, *somewhat Opalescent*.—This glass shortens the spectrum by cutting off the extreme red rays beyond the blue ray.

5. Cobalt Blue Glass.—The spectrum obtained under this glass is perfect from the extreme limits of the most refrangible rays down to the yellow, which is wanting. The green ray is diminished, forming merely a well-defined line between the blue and the yellow rays. The orange and red rays are partially interrupted.

6. Deep Green Glass.—The spectrum is cut off below the orange and above the blue rays. Although the space on which the most luminous portion of the spectrum falls, appears as large as when it is not subjected to the absorptive influence of the glass, there is a great deficiency of Light, and on close examination with a powerful lens, a dark line is seen to occupy the space usually marked by the green ray.

A case was also prepared, containing five flat vessels filled with different colored fluids.

A. Red. *Solution of Carmine in Supersulphate of Ammonia.*—This gives a spectrum nearly in all respects similar to that given by the ruby glass (1.); all the rays above a line drawn through the centre of the space occupied by the orange being cut off.

B. Yellow. *A saturated solution of Bichromate of Potash.*—This beautifully transparent solution admits the permeation of the red and yellow rays, which are extended over the space occupied by the orange ray in the unabsorbed spectrum. The green rays are scarcely evident.

From the absorptive powers of the sulphurets of lime and potash in solution, I was very desirous of using them, but they were found to be so liable to decomposition when exposed to the sun's rays as to be quite useless for my purposes, sulphuretted hydrogen being liberated in such quantities as to burst the bottles with great violence.

C. Green. *Muriate of Iron and Copper.*—This medium is remarkably transparent; the blue, green, yellow, and orange rays pass freely, all the others being absorbed.

D. Blue. *Cupro-Sulphate of Ammonia.*—This fluid obliterates all the rays below the green ray, those above it permeating it freely.

E. White.—This is merely water rendered acid by nitric acid, for the purpose of securing its continued transparency. It should be noted that spaces in the boxes have been left open to the full influence of the Light, that a fair comparison might be made between those plants growing under ordinary circumstances, and the others under the dissevered rays.

It will be seen from the above, that the following combinations of rays have been obtained to operate with.

1. and A. The calorific rays well insulated.

2. A smaller portion of these rays mixed with a small amount of those having peculiar illuminating powers.

3. The central portion of the solar spectrum, well defined, and all the rays of least refrangibility, thus combining the luminous and calorific rays.

4. The luminous rays mixed with a small portion of those having a calorific influence.

5. The most refrangible rays with a considerable portion of the least so; thus combining the two extremes of chemical action, and affording a good example of the influence of the calorific blended with the chemical spectrum.

6. Some portion of those rays having much illuminating power, with those in which the chemical influence is the weakest under ordinary circumstances.

B. The luminous rays in a tolerably unmixed state.

C. The luminous rays combined with the least actively chemical ones, as in 6.; but in this case the luminous rays exert their whole influence.

D. The most refrangible or chemical rays well insulated.

E. White Light.

From these arrangements it will be evident, that, although we do not secure the complete isolation of the rays, as we should do with a prism, we procure Light in which the great preponderance of one influence over others, suffices to insure, to a certain extent, the decided action of that one. I am well aware that we only arrive at approximations to the truth by the system adopted, but I am also unacquainted with any method by which these experiments could be tried for any time, otherwise than with absorptive media.

When we look on a spectrum which has been subjected to the influence of some absorptive medium, we must not conclude, from the colored rays which we *see*, that we have cut off all other influences than those which are supposed to belong to those particular colors. Although a blue glass or fluid may appear to absorb all the rays except the most refrangible ones, which have usually been considered as the least calorific of the solar rays; yet it is certain that some principle has permeated the glass or fluid, which has a very decided and thermic influence, and so with regard to media of other colors.

The relative temperatures indicated by good thermometers placed behind the glasses and fluid cells, which I have used, will place this in a clear light. The following results present a fair average series, and distinctly mark the relative degrees in which these media are permeable by the heating rays:—

Glasses.

Color.	Rays not absorbed.	Temp.
1. Ruby.	Ordinary red, and the extreme red	87
2. Red.	Ordinary red, and orange, portion of extreme red . .	83
3. Orange.	Little blue, green, yellow, orange, red, and extreme red	104
4. Yellow.	Red, orange, green, and blue	88
5. Blue.	Violet, indigo, blue, little green, and some red . .	94
6. Green.	Orange, yellow, green, and blue	74

Fluids.

A. Red.	Ordinary and extreme red	78
B. Yellow.	Ordinary red, and yellow	80
C. Green.	Blue, green, ye[illegible] orange	69
D. Blue.	Green, blue, indigo, violet, and trace of red	73
E. White.	All the rays	89

Here we see, that contrary to what we might have supposed at first, the highest temperature is not obtained behind the red media, but behind those which have a yellow or orange tint. Indeed, a higher temperature is found behind the colorless fluid than any of the others; and when we consider, that the thermic influence is not confined to the red spaces of spectrum, but that it extends over all the visible rays, and to a great extent below them, we see at once that a larger quantity of radiant caloric must permeate the least colored media It will also be shown in a future

chapter, that red glasses and fluids absorb a larger quantity of the heat rays than any others except black ones, and consequently indicate a higher temperature themselves although a lower one is observed behind them.

With these arrangements it was distinctly proved, that under the influence of the luminous and calorific rays, germination was, in many cases, entirely prevented, and in all, the growth of the young plant was checked, and the development of leaves and buds prevented. The following results have been obtained with carefully selected roots of tulips and ranunculuses.

The first appearance of germination took place with the tulips under the orange glass (3,) which was followed in three days by those under the red glass (2), then by those under the ruby glass (1), and next by those under the influence of the yellow (4), blue (5), and green glasses (6). The roots under the orange glass developed the cotyledons a week earlier than those under the yellow, blue, and green glasses. But that the ranunculuses observed the same relative order in germinating, I should have suspected that some peculiarity in the bulbs had influenced the result although these had been selected with the most scrupulous care. At first the greatest progress was made by the tulips under the yellow (4) and orange glasses (3); but the leaves under each of these were by no means healthy, particularly under the yellow glass (4), which had a singularly delicate appearance, being of a very light green, and covered with a most delicate white bloom.

The leaf-stalks of the tulips shot up remarkably long, and were in both cases white; at length an exceedingly small flower-bud appeared on the plant under the orange glass (3), which perished almost as soon as it appeared, and the death of the plant immediately followed. The tulips under the yellow glass (4) never showed any buds, and their vitality soon failed them. The condition of the ranunculuses was in most respects similar to that of the tulips; they exhibited the same exuberant length of stalk, but the leaves were of a more healthful appearance. These plants, however, never showed any flower-buds, and they died nearly about the same time with the tulips.

PHOTOGRAPHIC RE-UNIONS.

BY THE EDITOR.

Our two former articles on this subject seem to have given so much satisfaction to our readers, that we are induced to continue the subject in the present number, although we had intended to give sufficient time for an interchange of opinion among Daguerreotypists.

We are the more emboldened to do this, as we find our views coincide well with the majority of our first class artists, many of whom have done us the pleasure of calling and expressing their approbation, urging at the same time the necessity of our incessant endeavors towards its accomplishment.

We are very anxious, we can assure our friends, for the formation of a National Photographic Society, for we feel confident, that no proceeding on the part of Daguerreotypists would be more conducive to their honor, intelligence or interests.

There is actually no reasonable cause for the jealousy we find so prevalent among our artists. When we converse with any of them on the prospects, and position of the art, we have always found each and every one—we do not remember a single instance to the contrary—willing to accord the full meed of excellence due to his brother artist. The nature of the jealousy, therefore, appears to us to be the effect, not so much of envy as to the degree of excellence to which any particular artist attains, as to the estimation in which he is regarded

by, or the reputation he has secured in the public mind.

This feeling is by no means to be censured, for it eminates, in a majority of cases, from a laudable ambition to be equal, if not superior to others, and so long as this jealousy is kept within these bounds, so long will it do honor to him who entertains it. It is only the vulgar jealousy of little minds, who, feeling their inferiority, are ever unwilling to acknowledge the skill of others, that carries with it a baneful influence.

Our Daguerreotypists — we mean the more intelligent and respectable portion—have only to personally understand each other, more perfectly, to be on most intimate terms of friendship. This bond of union can never exist so long as they observe the studied reserve—the effect of an imaginative misunderstanding — now so prevalent among them.

The great difficulty appears to be that each is suspicious of his rivals sentiments in regard to himself. But it is with pleasure that we can assure all, that they have no cause for such feelings, as we have already shown.

To close this breach of misunderstanding we have only to consolidate the scattered fragments of friendship, separate them from the dross of suspicion and reserve, and form them into a solid wall of mutual love and interest.

The following extract is good for all climates, societies and occupations, and is so applicable to our present subject, that we cannot avoid transcribing in here.

" In so beautiful a world as ours, where everything combines to rejoice the heart, and lead it to virtue, love and truth, it is passing strange that mankind will turn away from the blessings around them and yield to the influence of bad feelings and hateful passions. There is not a community or a neighborhood, where hate and revenge are not seen blasting and destroying all that is pure and lovely in man. Dwellers beneath the same roof, in scores of instances, breath out the ebullition of passion and exert themselves to vex and torment each other. Why is this? Why will not people bear and forbear, and labor to live on terms of friendship? Why will they not be kind and affectionate, and strive to to promote the welfare of each other? You must not expect that everything will go on smoothly—that you will not be troubled by a neighbor or his children, his cattle, his swine or his fowl. If you are a little disturbed, or your rights have been unthinkingly taken from you, do not fly into a passion and breathe out vengeance against your friend. If you feel that you have been wronged, say nothing about it to another neighbor, while you treasure hard feelings in your bosom, but go to him and there make your complaint, and he will endeavor to remedy the evil. Thousands of quarrels, which are settled in law, were begun by trifling causes —so trifling that they are referred to in after life with shame. They might have been stopped at once, had proper measures been taken, and kind words instead of threats been used.

"All are liable to err, and those who are the most guilty are frequently the first to censure others. They who bear the least from their friends are the most inclined to provoke. It would seem that men might learn wisdom from the experience of the past and labor to prevent unkind words, bickerings and quarrels. When they see the misery that has been produced by trifles 'lighter than air,' they should form the resolution never to use a harsh word, throw out a base insinuation, or show a revengeful look.

" Mankind should live like members of one family, and labor to promote the welfare of each. Instead of picking out blemishes in your friends and denouncing their proceedings, how much better to dwell on their virtues and kindnesses. If they unintentionally wrong you, instead of flaring up and showing your spite with harsh words, or doing them an injury, reflect they have done you many favors; how many times they have visited you in sickness, sympathized in sorrows, and when they had a rarity, shared with you and your children. Reflecting thus would disarm you of all unkind and revengeful feelings, and you could not find it in your heart to do them an injury. When the temper is aroused, how common it is to forget past favors, and bring to mind every mole-hill difficulty on reflection, which, when in anger amounts to a mountain in size, and then decided as passion and not as reason dictates.

" Live peaceably is not only a wise pre-

cept but a sacred injunction. But this you can never do unless you strive to follow peace with all men. If you reflect upon and treasure up every harsh word, you will always be in trouble. If you pass over a little injury and banish it from your mind, and return good for evil there will be no trouble; you cannot be otherwise than good citizens, good neighbors, and fast friends. How soon would earth resemble heaven, and everything glow with the beauty and freshness of paradise, if mankind would banish anger and revenge from their bosoms and were determined to live peaceably and happily with their neighbors."

Let the sea of life be ever so stormy, a little oil of concession will always calm the agitated surface, while a timely reef in the sail of contention will save a plunge into the depths of dark regret, or a gentle turn of the wheel of generosity save a crash among the breakers of ill-will.

There is nothing like mutual interchange of sentiments and feelings to break down the barriers of mistrust and suspicion, and there is no method of bringing about this interchange to be compared with re-union assemblies; therefore do we advocate the formation of a Photographic Society.

Although all with whom we have conversed appear to be equally anxious for the consummation of this important measure, all are equally averse to take the first step, from the fear that the jealousy supposed to exist will prevent others from seconding the movement. Now, they must know that there is a beginning to everything and that without a first cause to create that beginning the thing must remain void. This is a carollary so simple that it seems almost too ridiculous to enter into the category of our argument, but it appears necessary from the nature of the case under discussion.

To those who have done us the honor of requesting us to take the initiatory step, we must reply, that, to our mind, it would be extremely indecorus on our part, for the reason, that we are not practically engaged in the business of daguerreotyping, and consequently it would be an assumption on our part of a privilege which rightly belongs to practical operators alone.

Nothing could please us more than to be placed in the honorable position such a step would confer upon us, but we cannot take advantage of a situation which we honestly believe should be accorded to another more deserving. We must, therefore, be content with giving whatever advise we think will be most sound and agreeable to the larger portion of those most interested in the subject, and we shall be perfectly satisfied, if by following any portion of it, our Daguerreotypists consummate the affair to their own satisfaction.

The course we shall recommend is this; let three, four, or more of the most prominent among those who have been the shortest time engaged in the practice of the art, sign a request to the oldest operator in the city to call a meeting of Daguerreotypists, and lay before them the importance and utility of forming a National Society. This done, let a series of resolutions be passed expressive of the sense of the meeting, and then appoint a committee to draw up an address to the Daguerreotypists of the United States impressing upon them the force of the resolutions, and calling upon them to reciprocate the feeling, by the appointment of delegates to meet those of New York at some central point in the United States to discuss the matter and form the parent Society. After this elect your own delegates, and if you please take the initiatory steps for forming an auxilliary Society for New York city.

We think this course will avoid all causes for jealousy or bickering and will place each artist on an equality.

Some sacrifice of personal consideration must be made, and all honor be to him, who throws all these considerations aside and boldly takes the responsibility of the first step.

A TREATISE ON PHOTOGRAPHY;

Containing the latest Discoveries and Improvements appertaining to the Daguerreotype.

BY N. P. LEREBOURS, *Optician to the Observatory, Paris, etc., etc.*
TRANSLATED BY J. EGERTON;

WITH A PREFACE, NOTES AND ALTERATIONS, BY H. H. SNELLING.

CHAPTER XVII.

Of the Accelerating Solutions.

We have before said, that of all the accelerating substances, the best in our opinion is the bromine-water *of a determined strength.* The reader will see, by Mr. Fizeau's "Mémoire," how simple and easy is its preparation. We have said at Chapter VI. that the results which are obtained by it are always identical. It seems, therefore, very probable to us that all the other compounds of uncertain action will be at last entirely superseded, as they are already to a great extent by the bromine water. We have said that the Hungarian liquid possessed much of this uniformity of action; those persons who do not like to change each time the solution, and who prefer applying the accelerating substance, not by counting the number of seconds, but by consulting the tint of the sensitive coating must employ this liquid in preference to any other. However, as certain substances, such as the chloride of iodine, used by Mr. Claudet, which was the first proposed, the bromide of iodine, and other mixtures, obtained a great degree of success when first introduced, and as several experienced persons still use them, we have thought it would be proper to give the manner of their preparation and use.*

In all these liquids iodine and bromine constitute a larger or smaller proportion. The iodine is indispensable, to form, by its combination with the silver, the coating of iodide; and the bromine applied upon this compound increases its sensitiveness; the iodine must alone be in contact with the silver, to form an iodide; what proves this is, that its compound, such as the Reizer liquid and the iodide of bromine, the use of which dispenses with the iodine-box, because they contain an excess of iodine, possess a much greater degree of sensitiveness; whilst all the substances in which the bromine is in excess can give no result until after the application of the coating of iodine.

We will successively give some details on the preparation and use of the bromine water, of the chloride of iodine, of the bromide of iodine, and of the Hungarian liquid, all which serve after having made use of the iodine-box. We will afterwards say a few words on the Reizer or German mixture and how to make use of the iodide of bromine, both which are used without the iodine-box.

* Bromide of Lime was not in use in Europe when this edition was published and can scarcely be said to be so new. The manner of preparing this favorite mixture will be found in our number for February. Our favorite sensitive, however, is the bromide of iodine, as we are of the opinion that the pictures produced by it cannot be surpassed either in richness of tone, or in boldly drawn outline. Its slow working would have no weight with us—we should prefer sacrificing time to taste. —*Ed.*

PRACTICAL DETAILS ON THE USE OF BROMINE, BY MR. FIZEAU.

"When Mr. Daguerre's iodized plate is exposed to the vapor of the bromine, the latter is absorbed, and a coating is formed the sensitiveness of which increases with the quantity of bromine absorbed up to a certain limit, beyond which the picture cannot be rendered visible by the mercury. The favorable point for operating is near this limit; too near the impression begins to be obscured; too far from it, the sensitiveness diminshes: it was necessary to determine this point with precision, and to obtain it with regularity—which has been attended with some difficulty; for we cannot, in this case, have recourse to the color of the sensitive coating, which changes but little under the influence of the bromine; the orange-yellow tint of the plate does indeed deepen a little by the formation of the bromide, but the color of a plate bromined to a proper degree, and that of one which has passed the limit I have spoken of, differs

so little that the operator can, by that only, appreciate in a very uncertain manner the quantity of bromine absorbed, and consequently the sensitiveness of the plate.

"The method which I have proposed is exempt from this cause of uncertainty; it consists in exposing the plate to the vapor of an aqueous solution of bromine, of a determined strength during a determined time. I will try to explain this more at length:—

"1. *Of the Solution of Bromine.*—To prepare a solution of bromine, of an ascertained degree of strength, and adapted to the operations we are treating of, the first thing to be considered is the saturated solution of bromine in water; this saturated water is prepared by putting into a bottle pure water and a large excess of bromine; you shake the mixture well for a few minutes, and before using it, let all the bromine be taken up.*

"An ascertained quantity of this saturated water is then diluted in a given quantity of pure water, which gives a solution of bromine that is always identical; this dosing is performed very simply in the following manner: take a small glass tube, which may be applied also to other uses, and, having marked on it a line measuring a small quantity, have also a bottle with a similar line measuring a quantity equal to thirty times that of the tube; then fill the bottle of water up to the mark, and fill the tube also to the mark with the saturated solution of bromine; then pour the smaller measure into the bottle.†

"The natnre of the water used is not in this case unimportant; the proportions above mentioned have been established when calculating upon having perfectly pure water; but it is well known that the water of rivers, springs, &c., is not pure; but these different kinds of water may all be used with equal advantage to pure water, by adding a few drops of nitric acid, until they have a very slight acid savor: five or six drops per quart suffice for most kinds of water.

"A bright-yellow liquid is thus obtained, which must be kept perfectly air-tight: it is the normal solution, which I shall simply call bromine-water, to distinguish it from the saturated water.

"2. *Of the Bromine-box.*—The box employed to expose the plate to the vapor of the bromine-water may be constructed in different ways; that which I have employed from the first is arranged in the following manner:—

"It is made of wood, and folds up, in order to occupy less room; it should be blackened inside with a color which cannot be attacked by the bromine; its height is about six inches; the other dimensions should be such that the plate may be at about an inch and a quarter from the sides every way. It is divided into three distinct parts: the lid, which serves as the plate-board; the body of the box; and, lastly, the bottom, on which is placed the evaporating-pan; this moveable bottom is a little hollowed out in the middle, which serves to put the pan exactly in the same place in different experiments.

"The evaporating-pan should be flat bottomed, shallow, and about half the size of the plate: it should be covered over with a sheet of glass, fitting it exactly to prevent evaporation.‡

"The tube I have spoken of will serve to put into the pan a uniform quantity of bromine-water; it must, therefore, be sufficiently large to contain enough of the liquid to cover all the bottom part of the pan.

"3. *Manner of Operating.*—I have before said that the plate should be exposed to the vapor of a solution of bromine of a given strength, during a given time. Now, for the bromine-water to be always of the same strength, in successive experiments, it is evident that it must be renewed for each plate: this is the only means of obtaining a constantly similar evaporation:

* Mr. Bisson has proposed the use of a sort of acrometer for the obtaining a solution which should be always of the same strength; it is easy of application, but this instrument requires in addition to it, tables of corrections for the different degrees of temperature.

† The reader has seen at Chapter VI., that we advise the use of the bromine-water, at the degree of strength of 1-40th, and that we recommend to substitute our bottles with marked divisions in lieu of the glass tube.

‡ The bromine-box in use among American artists is, in our judgment far superior to the one above described, and is too well known to require a description from us. The Messrs. Lewis are making some improvements in Daguerreotype apparatus which we shall give in another chapter —*Ed.*

and I have only thought the use of the bromine practicable, since I had the idea of resorting to this very simple method.

"As to the time during which the plate should remain exposed to the vapor of the bromine-water, it will be easily understood that it must vary with the dimensions of the box, the surface of evaporation, &c.; but, with the same apparatus, it is constant with the bromine-water of the strength laid down. We have pointed out above, the time of exposition should be between thirty and sixty seconds, according to the size of the apparatus: a few trials will suffice to determine the duration, once for all, for each box used.

"I shall point out, in a few words, how this is done.

"Place only the bottom of the box, with its pan, upon a table; fill the tube with bromine-water, which pour into the pan at one of the angles of the same, after having pushed aside the ground-glass sufficiently to admit the point of the tube, and replace the glass; then if the box is not placed horizontally, arrange it so by means of the colored bromine-water seen through the glass-plate; when the pan is perfectly level, and the liquid covers uniformly the whole surface, complete the arrangement by placing the second part, or body of the box, over the bottom.

"Everything being thus arranged, and the plate iodized, with one hand uncover the pan, whilst with other, carefully put in its place the lid with the plate, and then count exactly the number of seconds required; it is advisable to turn the plate round at about half the interval that the exposition is to last, in order to equalise the action of the bromine.

"For a second operation, the small dose of bromine-water just used, must be thrown away, and replaced by a like quantity; the time will thereby remain the same for each of the plates successively, and they will be of exactly the same degree of sensitiveness.

"To these details I will add a few notes, on some difficulties which may be experienced in the use of the bromine."

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"The saturated water being considered as of uniformly the same strength in the preparation of the bromine-water, you must avoid all causes which might produce an alteration in the quantity of bromine that solution contains; therefore observe particularly—first, to avoid any organic substances, such as wood, cork, &c., falling into the bottle, as, if that were the case, those substances would form a sufficient quantity of bromic acid to impair, as Mr. Focault has remarked, the dissolving faculty of the liquid; the bottle should therefore be closed with a ground-glass stopper. 2ndly, It is necessary to avoid leaving the bottle in the light of the sun, which might produce the same effect. 3rdly, To take care that the bromine in excess should always be considerable, as this excess is necessary to maintain at a proper degree of saturation the solution, which always becomes weaker by the unavoidable evaporation.

"The temperature and nature of the water used, provided it be not too impure, does not exercise any very important influence upon the quantity of bromine dissolved; it is therefore evidently easy to have a saturated solution of unvaried strength.

"The quantity of bromine which the normal solution contains is so inconsiderable, that the very small quantity of calcarerous and other salts, which running waters hold in solution, would absorb a considerable proportion of it, if these waters were employed in their natural state. A few experiments have proved to me that the quantity absorbed by water from the Seine amounts to about one quarter of the bromine. Other kinds of water will certainly absorb a larger proportion, so that this effect must not be overlooked. If the operator had always at his disposal the same water, the preparation of the normal solution might be made, allowing for this absorption; but when travelling where the operator will find different water in each locality, he must have recourse to distilled water to obtain uniform results. I have therefore endeavored to find the means of using all kinds of water, without regard to their composition. It is sufficient for that purpose to neutralise, by a few drops of acid, the carbonates which appear to produce this absorption; as soon as the water exercises an acid reaction, it becomes as fit for the preparation of the bromine-water as distilled water. I must, however, remark, that such would not be the case with

sulphureous waters, even were they but slightly impregnated with that mineral.

"It is necessary here to observe, that as the hyposulphites absorb bromine in a large proportion, it is indispensable to keep the hyposulphite of soda far apart from the bromine water, as the smallest quantity of this salt falling into the bromine-pan or bottle would absorb all the free bromine contained in either.

"When once you have a bottle filled with bromine-water, you may prepare successively large quantities without the use of a measure, merely by consulting its color; for that purpose, you must have two bottles exactly alike, and always keep one full of the normal solution, and prepare in the other a solution which is brought by successive trials to precisely the same tint as the first; with a little practice, this method, which appears very inadequate to attain the object in view, is, however, susceptible of a very great degree of exactness. When travelling, in case one should lose or break the small measure, it might be of very great assistance.

"The seasons have some influence, on account of the state of the temperature, on the tendency to evaporate which the bromine-water has; in summer, the plate should be exposed to the bromine a few seconds less than in winter. The changes of temperature having this influence, avoid exposing the bromine-pan and box in the sun, as is sometimes done during the intervals of the experiments, to cause the bromine to evaporate.

"Some precautions are necessary in the use of the evaporating-pan: 1st, It must not be greasy, in order that the bromine water may completely cover the whole of the bottom, otherwise the surface of evaporation would not be uniform; when that does occur, it must be rubbed with a very clean piece of linen cloth, with a few drops of alcohol. 2nd, Avoid, in pouring in the liquid, or in adjusting the level, allowing the bromine-water to wet the sides so as to touch the ground-glass, as, were it to come in contact with the latter, it would wet the edges of the pan, and thereby alter the regularity of the evaporation.

"The time must be exactly calculated for the exposition to the bromine, and for that in the camera; if you have not a chronometer, nothing is more convenient than pendulums formed of a little leaden ball suspended to a thread; they may be made for seconds or half seconds; the former must be 994 millimetres in length, the latter 248. When the duration of exposition in the camera is brief, it is necessary to count at least the half seconds: with the intensity of light which exists in Mr. Daguerre's normal apparatus, it is sufficient to reckon the seconds. If you operate in the sun, sixteen to twenty-two seconds will be required; in the shade the duration will generally be comprised between forty seconds and a minute.

"When you make use of bromine, it is advisable to adapt variable diaphragms to the object-glasses, in order to obtain at will a more rapid action or a greater degree of distinctness; but it is an indispensable condition that the surfaces of their openings should be in simple relative proportions one to the other. You may thus vary the intensity of the light in known proportions, and so obtain an identical effect, as the duration must be in an inverse ratio of the intensities. It is evident that the duration, which corresponds with each diaphragm, varies in a simple and known proportion, which allows of operating with these variable diaphragms with as much certainty as with a fixed one.

"This means has been eagerly adopted by Mr. Lemaitre, a skilful artist, who was the first to use bromine for large plates.

"One thing, which it is very important to avoid, is that of subjecting the plate to the action of the mercury in a place where the vapor of bromine is exhaled; for if, during the time that the iodized plate is being taken out of the frame and placed in the mercury-box, it were to come in contact for a single moment with the air in the slightest degree impregnated with bromine, the effect produced on the image in the camera may be so completely destroyed, that no image can be formed on the plate by the action of the mercury.

"This effect has a tendency to be produced partially towards the edges of the plate, when it is fixed upon a frame; for in that case, the wood being slightly impregnated with bromine at the same time as the plate, emits vapors continually, which though slight, are sufficient to destroy the action of the light on the borders of the plate. This effect will be avoided by co-

vering the borders of the frame up to the edges with thin plates of metal; zinc or tin will answer the purpose very well.

"The iodine has the same action as the bromine, but being less volatile its effect is less to be apprehended. I think it was an action of the kind above alluded to, and not the unequal thickness of the sensitive coating, which gave the black borders to the impressions which Mr. Daguerre so successfully avoided by his metal bands. I also think that this same action satisfactorily explains the singular anomaly observed by so many operators, which consists in the almost absolute impossibility of operating with certain cameras. In almost all those cases the iodine-box is found to have been contained in the camera; now, as the former always gives out a little of its vapor, the inside of the camera always becomes impregnated with a small quantity of iodine, which continually emits some portions of it, and whilst the plate is being subjected to the action of the light, it is thus placed in contact with slight vapors of iodine, which neutralise wholly or in part the action of the light.

"It is, therefore, advisable to prevent either the frame or camera from becoming impregnated with vapor of bromine or iodine, however slight, and if it did happen, the wood should be exposed to the open air and to the sun for some time."

MR. FOUCAULT'S BROMINE-BOX.

Mr. Foucault uses the bromine-water extremely weak, viz., the proportions of 5 grammes of bromine water to 1000 grammes of filtered river water. His box is made of wood lined with glass properly secured with putty, and rests upon three adjusting screws, which, together with a spirit-level, serve to bring the box to a perfect level. The height inside is about 3 centimetres; the upper part of the box is covered by a glass slide-trap, which shuts hermetically, and which is made so as to receive underneath the frame bearing the plate, which is supported by rests.

One of the side-glasses is perforated in its upper part by a hole, which allows of introducing the solution when the trap is shut; and at the bottom of the box, near one of the angles, is a little glass tube, destined to draw off the solution which has been used.

The following is the manner in which Mr. Foucault recommends it to be used:

When the plate is iodized to the proper degree, it is placed in the frame in which it may be left for a very long time, even several hours, which may be very convenient when watching a favorable moment to operate, such as a ray of sunshine, or any other circumstance. When ready to operate with the bromine, fill the bottle I have before spoken of with the solution, by means of the funnel, which should be done quickly, in order that the bromine may not evaporate. Then put the funnel into the bent tube taking care to shut the glass slide, and pour the solution rapidly into the box. It is important that the interval between the instant when you have poured the last drops into the box, and that when you draw the slide, should always be the same in each operation; half a minute, for example. This is easily done by a watch with seconds, or by counting to a certain number; at the same time shake the box slightly that the solution may be spread all over the bottom, and place the frame on the rests made to receive it When the half minute is expired, draw the slide quickly; and, by means of a watch, or any other instrument for counting seconds, as it would not be sufficiently exact to depend on one's own calculation, count a certain number of seconds which must be determined for each apparatus, but limited, however, to between twenty seconds and one minute.* You will know whether the operation has lasted too long, or that the plate has absorbed too much bromine by the impression becoming veiled or obscured under the influence of the mercury. In the proportion that an iodized plate absorbs bromine, its sensitiveness gradually increases up to a certain degree, beyond which the least excess causes a mist upon the proof. It is this critical point that you must reach to obtain the maximum of sensitiveness, and it is only by repeated trials that you can attain it. If you do not reach it, the plate will not be sufficiently sensitive, but this can only be known with certainty by other experiments; if you have gone beyond it, the mist or veil over the impression shows it immediately. When the proper

* This number of seconds varies but little with the changes of temperature. Experience can alone point out the limits of that influence.

time has elapsed, take up the plate, which place immediately in the frame, and it is then ready to receive the impression of the light.

MR. CLAUDET'S PREPARATION OF THE CHLORIDE OF IODINE.

The chloride of iodine is prepared by bringing chlorine gas into combination with iodine. To obtain chlorine,* put into a glass retort some peroxide of manganese broken into small pieces, and upon that some hydrochloric acid. To the retort is adapted a tube twice bent: this tube communicates with a small bottle, which contains the iodine; some charcoal, or a small flame from a spirit-lamp under the retort, suffices to disengage the chlorine; the iodine becomes promptly liquefied. As soon as the liquid which results from the combination has attained the color of a bright red, the operation is terminated. The bottle must be immediately closed with great care; for that purpose, put a little tallow round the ground-glass stopper.

MANNER OF USING IT.

The chloride of iodine may be used in two different ways; pour two or three drops in a gallipot, put upon it a small quantity of cotton to retard and regulate the evaporation; and after the plate has been iodized to a golden yellow, expose it above the chloride of iodine; when it has attained a rose-color, it is placed in the camera.

The other method is attended with one advantage, which is, that it does not occasion the development of vapors, which are disagreeable to the operator, and very pernicious, inasmuch as they attack all metals indiscriminately.

Pour a few drops of the mixture into a bottle of pure water, so as to give it the color of Cognac brandy, and use it with the pans in the same manner as all the other substances.

Mr. Claudet has also combined chlorine with bromine, but this compound is not now in use.

PREPARATION OF THE BROMIDE OF IODINE, BY MR. T. GAUDIN.

"Pour into an alcoholic solution of iodine,† drop by drop, some bromine, until the mixture becomes of a beautiful bright red; then dilute it with water, so as to produce a liquid of a bright yellow. This is the bromide of iodine ready for use, provided the proportion of bromine be proper, which practice alone can determine.

"It is earnestly recommended to those who would themselves prepare the bromide of iodine, to be on their guard against the splashing of any particles of bromine whilst pouring it into the alcoholic solution of iodine; for it is the most violent of corrosives, and the smallest particle coming in contact with the eyes will be sufficient to destroy the sight. Neither should the bromine be kept in the inhabited part of a house, lest its emanations, developed either by heat or by breaking of the glass, should mix with the air which is breathed."

HUNGARIAN LIQUID.

This mixture has been introduced by Mr. Guerin; the recipe has not been made public. The remarkable uniformity of results obtained by the Hungarian liquid gives to it a very marked superiority. Similar in appearance to the bromide of iodine, it differs doubtless by its composition. Thus, whilst the latter requires, to preserve its sensitiveness, to be each day re-inforced by a few drops of bromine-water, we have known the Hungarian liquid, after a considerable lapse of time, preserve such a degree of sensitiveness as to be but little inferior to the bromine-water.

MANNER OF USING IT.

It should be diluted in ten or fifteen times its volume of water, and preserved in a bottle, with ground-glass stopper.

When wanted for use, pour a small quantity of it into one of your pans, and, (the plate having been previously iodized to a rather light golden yellow,) subject it to the fumes of the liquid, consulting the color from time to time until it has attained a light rose tint.

If small white specks were formed on the plate, it would be a proof that the mixture is too strong, and it should be further diluted with water.

There are but two preparations—Reiser's mixture and the iodide of bromine—

* We remind our readers that chlorine is a very deleterious substance: it is, therefore, necessary to use the greatest precautions to avoid its effects.

† "The proportion of iodine dissolved in spirits of wine is of no importance; but it is better to employ a saturated solution."

with which the iodine-box is not necessary. We will give hereunder the manner of preparing and using them. Although seldom employed, they may be useful in case the iodine-box were broken.

ON THE IODIDE OF BROMINE.

On this subject Mr. T. Gaudin says:—

"We shall give this name to the bromide of iodine, with excess of iodine, to distinguish it from the bromide of iodine, heretofore employed after iodizing the plate. It is prepared by pouring into the bromide of iodine, with excess of bromine, an alcoholic solution of iodine until a precipitate is produced, having the appearance of iodine. To make use of it, dilute it with water until it assumes a saffron color, and has an odor approaching that of cider.

"This compound being very variable, it is necessary to modify it every day with the alcoholic solution of iodine; or bromine water, guided in this respect by acquired experience.

"If the sensitive coating assumes an irregular appearance, it is evident that bromine is in excess; and that there is iodine in excess if the coating is not found sensitive enough."

REISER'S, OR GERMAN MIXTURE.

The Reiser mixture is nothing but a chloride of iodine, of which we have given the preparation in a previous page; only, instead of using it in a saturated state, it is diluted with water, and the solution used in a flat pan.

The following are the proportions given; but it not at all necessary to conform to them strictly.

Put into a glass retort, 500 grammes of peroxide of manganese, and 250 ditto of hydrochloric acid. In the small bottle which is to receive the chlorine gas, put 90 grammes of iodine. When the iodine is liquefied, and the compound has reached a bright red tint, it is diluted in about 500 grammes of water.

It will be perceived that this liquor is nothing else than a chloride of iodine diluted with water. It has been customary, for some time past, to add bromine to this preparation, which renders it a little more active; but it is far from having the constancy and rapidity of action of either the bromine-water at a given strength, or the Hungarian mixture.

CHAPTER XVIII.

On the Continuating Glasses.

Mr. Edmond Becquerel has made numerous researches on the chemical radiations which accompany the solar and the electric light, and has arrived at this conclusion; that *rays which cannot produce a sensible impression upon a prepared substance, out of the sphere of all radiation, may continue in a very energetic manner, an action which different rays have begun to exercise upon it.* Consequently, he calls the first *exciting rays;* and the others, *continuating rays.*

Among the interesting experiments made by Mr. Edmond Becquerel, we will cite the following, for which he made use of a glass, which, when examined by the prism, only transmitted to the eye red and orange rays.

Having prepared in the dark a sheet of sensitive paper, by impregnating it successively with bromide of potassium, and then with nitrate of silver, he cut off two pieces of similar size, which he placed at the bottom of a wooden box, and then covered them entirely with a metal plate, the middle of which was cut out so as to represent a bouquet of flowers. The whole being then covered over, and the light hermetically shut out by a wooden board, was carried before a window facing the north; he then opened and shut the obscurator, so that its exposition to the diffused light of a clouded sky did not exceed one second. When taken back into the darkened room, the two papers showed by the light of a taper some very faint traces of the image, which it was presumed ought to exist on it. The paper on which these traces were least distinct, was then placed under a sheet of red glass, and exposed to the diffused light in a northern aspect from one o'clock till five. When the apparatus was taken back into the dark room, the image of the bouquet was perfectly distinct; those parts which had received the direct action of the light, through the openings of the plate, were entirely blackened, and the other parts which had been preserved from the contact of the light, remained perfectly white, and had undergone no alteration. As to the other paper, it was still in the same state.

This experiment is conclusive, for, on the one hand, the image developed under

the red glass in the absence of the object, must have existed on the paper, invisibly traced by the instantaneous action of the direct radiation. On the other hand, the part which had remained unchanged, notwithstanding the action of the red glass, must therefore have been insensible to that action. It is therefore established, that *certain rays exist, which are incapable of exercising primitively an action upon the paper, whilst these rays are very well calculated to continue that action, when it has been begun by other rays.*

The importance of this discovery for the photographic art, will be easily understood by the following letter, addressed a short time afterwards to Mr. Becquerel, by Mr. Tony Gaudin:—

"I have the pleasure to announce to you, that the discovery made by Mr. Edmond Becquerel, concerning the photographic action of the red rays, already so clearly proved in the report of Mr. Biot, applies perfectly to Mr. Daguerre's process, as you will be able to judge by the specimens which accompany this letter.

"Messrs. Buron and Lerebours had obtained, before I made my researches, some very remarkable results with the direct rays of the sun; but now I can no longer doubt that with a red light, we may be able to operate instantaneously, for I am already able to send you clouds obtained *during a high wind near the zenith, in half a second.*"

A few weeks after, Mr. Becquerel announced the fact, that the action of the yellow glass was much superior to that of the red glass on the sensitive paper; and Mr. Tony Gaudin, then our colleague, confirmed this result, as regards silver plates.

USE OF THE CONTINUATING GLASSES.

The plate is iodized and exposed in the camera about fifteen times longer than when operating with bromine-water. On taking it thence, carefully preserving it from the least ray of light, it is put into a kind of sheath covered with yellow glass, and exposed to the direct solar radiation. The time for that exposition cannot be precisely determined; but the operation presents no difficulty, for the operator can see through the yellow glass the progress of the action. The proof is, therefore, only withdrawn when it will be found to have attained the proper point, which it is as easy to appreciate as when using the mercury-box.

By this process views may be obtained of exquisite delicacy of detail, and of a very peculiar tone.

With the accelerating substances the red glass must be used, but we have never obtained by that process results as satisfactory.

CHAPTER XIX.

Cold Process for Coloring and Fixing the Proofs. By Mr. Tony Gaudin.

"Dissolve one gramme of chloride of gold in half a litre of ordinary water, and thirty grammes of hyposulphite of soda in another half litre of similar water; then pour the solution of chloride of gold into that of soda by little and little, agitating it exactly as in Mr. Fizeau's preparation, of which this is but a variation.

"When you wish to use it, pour some into a plate, or any other vessel of the same kind, sufficient to cover the proof; then, after having added to it a drop of ammonia, immerse the plate in it as soon as you take it out of the mercury-box, after having wiped its back and edges, and agitate the mixture quickly from right to left, so as to dissolve rapidly the coating of iodide of silver as usual. As soon as the plate appears white, cease all rapid motion, but continue to give it a slight undulating one; for if it were allowed to remain still for only a few minutes the proof would be clouded. By little and little the surface of the plate takes a yellow tint, which darkens more and more, approaching to bistre. You stop, therefore, at the color you wish; and when the proof has been washed and dried in the manner previously explained, it will be found to be fixed, without any stain, with a limpid surface, and an extraordinarily warm tone. If you were to augment the proportions of the ammonia or chloride of gold, the operation would progress much quicker; but then the middle of the proof would be always much clearer than towards the border. The mixture may be used several times without being renewed; it does not, however, give such a beautiful color to the impressions as when it is newly prepared. By communicating to the vessel containing the solution a con-

tinual motion, the impression, when once immersed, will be fixed. During that time, and whilst attending to anything else, watch its color; and at the end of ten minutes, or a quarter of an hour, take it out of the bath and dry it."

END OF THE THIRD PART.

ON THE DISCOLORATION, BY MEANS OF ELECTRICITY,

OF PAPERS SENSITIVE TO LIGHT, AND ON A NEW CLASS OF ELECTRIC PICTURES, OR ELECTROGRAPHS.

BY M. AUG. PINAUD.

THE object of this inquiry is to study the action of static-electricity on the chloride, the iodide, and the bromide of silver, and to compare it with that of light on the same substances.

I at first employed Daguerreotype plates, iodized or bromized. On throwing electricity on to one of these plates, from a point, whether it were positive or negative, I obtained, in a very few moments, brilliant spots of the bluish color of steel, which were tinted at the edges. By this means, all sorts of figures or sketches can be traced. The discharge of a Leyden jar instantly forms circular spots of perfect regularity, presenting a very great analogy to those which Priestley obtained by means of powerful batteries on metallic surfaces merely polished.

Each of these modes of experiment was inefficient for the object I had proposed; for, independently of Priestley's experiment, M. Matteucci had recently shown that a series of sparks, falling on the silvered surfaces of a Daguerreotype plate *eventually* produces a bluish tinted spot. It is true that the electricity acts on the silver much more promptly, when the surface of the metals has been previously iodized; but this distinction may be regarded as illusory.

I have, in fact, proved, that the action of very little sparks on a silver plate is *instantaneous;* and that the spots which they form, although they be not immediately visible, do nevertheless exist from the very first moment. In order to alter the metallic suface, there is no need to prolong the current of sparks, as M. Matteucci did; an instantaneous escape of electricity, without visibly affecting the metal, developes on its surface a deep and lasting alteration which is rendered evident, as soon as a moist puff of breath has been directed upon the plate. The vapor condenses around the part which has received the electricity, and tarnishes the metallic surface; but the points which have been acted on by the electric fluid, remain brilliant, and seem moistened by a transparent film of water. These points therefore, possess the property of condensing vapor differently from the others. In this fact, there is an analogy, not hitherto noticed, with Moser's images.

Renouncing metallic iodized plates, I was led to examine the action of electricity on photographic papers. Their electric sensibility is extreme.

I take a sheet of paper, having a uniform coating of *bromide of silver*, and which is very dry. After having placed or pasted it on an insulated metallic plate, connected with the conductor of the electrical machine, a very fine metallic point, which is held in the hand, and *electrized negatively by induction*, is presented to the electrized paper, at a distance of one or two millimetres. Opposite to the point, there is immediately formed a round spot of a blackish brown color, which follows all its movements, and which may be extended at pleasure. The discoloration thus obtained has a deep brown shade, like that generated by light; and producing, when the point is slowly moved, the effect of an artist's stump. The experiment succeeds

very well with a little bundle of fine platinum wires, tied to a metal handle.

The metallic point may also be placed *in contact* with the paper, and be passed gently along its surface; the discoloration is then deep black, limited to the points which are touched, and the effect is that of a drawing pencil. . . . To prevent the point's tearing the paper, a wire is secured in the axis of a glass capillary tube, the lower extremity of which is melted in order to produce adhesion and the protruding part of the wire is cut off; the tube and the point then pass freely along the paper.

The experiment does not succeed, when paper is slightly moist.

The bromide of silver, which is so sensitive to negative electricity, does not undergo any *apparent* alteration, when exposed to the stream of positive electricity, which flows from a point attached to the conductor of the electrical machine.

I finally proved that the influence of electricity takes place in perfect darkness, upon papers which have been prepared during the night; and that consequently, it is totally independent of all previous or simultaneous action of luminous rays.

Papers prepared with nitrate of silver only, or with chloride of silver, have little electric sensibility. Papers covered with iodide of silver, which are but little sensitive to the action of light, are, on the contrary, very sensitive to the electric fluid. They present, beyond the others, this peculiarity, that they are affected, in a different manner it is true, both by the electricity from a positive point, and by that from a negative. The negative fluid forms a roundish black spot; the positive fluid developes in all the filaments of the paper among which it is diffused, a violet discoloration in a radiated form.

This double phenomenon is due to the decomposition of the iodide of silver. The iodine is determined to the positive point, and produces the violet color; the reduced silver is determined at the other point and causes the black spot. To a decomposition of the same kind, must also be attributed the action of electricity on papers prepared with bromide of silver; and if, in this case, no sensible discoloration is manifested about the positive point, it is because the bromine, which is liberated there, disappears, on account of its great volatility

The following curious experiment has confirmed me in this idea. I exposed a paper, prepared with bromide, to the direct action of the solar rays, until its tint became as deep as possible; I then subjected it to the action of two metallic points, one connected with the conductor of the machine, the other with the earth. The slate-colored shade of the paper immediately became black around the negative point, and formed a rounded spot; while, opposite to the positive point, there appeared a kind of star, which was white and very delicate, and indicating, by its ramifications, the radiating distribution of the vitreous electricity on the surface of the fibres of the paper. On reversing the order of the connections, and making the vitreous fluid pass to the black spot, and the resinous to the white star, the latter became black, and the former white. A fact worthy of observation is, that light acts very slowly on the white stars produced by the positive electricity, and that an exposure of more than three hours to the direct rays of the sun, although reducing their brilliancy was not sufficient to obliterate entirely all traces of them.

In the last place, I investigated, in my memoir, the action which the discharge of the Leyden jar exercises on photographic papers.

On making the experiment of piercing paper, the paper is perforated, and, on the bromized side, the hole is surrounded by a brown halo, which has the same appearance, whether the positive or negative coating is presented to it. This discoloration, produced indifferently by either coating of the Leyden jar, appears to me a new confirmation of the principle, that electricity is transmitted by a molecular vibratory motion, and not by a motion of transfer. In support of this principle, another and a more remarkable fact of discoloration obtained on photographic papers, by the spark of the condenser, is as follows:—Instead of passing the discharge through the paper by means of two opposed metallic points, I made it pass over its surface, by placing the two points of a universal discharger in contact with the prepared surface. The paper must be dry, and be supported on an insulating stand. The spark of a highly charged jar is passed, from point to point along a distance of four, five, and even six

centimetres, and the trace of this spark is instantly impressed upon the paper, by a reddish train, which records all its windings and sinuosities, and which resembles an actual scratch. It appears to me an interesting circumstance, thus to have obtained, notwithstanding the very fugitive character of its appearance, the form of the electric spark so capriciously broken as it is traced out by itself. . . Another infallible mode of succeeding, is to place the paper vertically between the two points, one above, the other below, at several centimetres apart. The electric fluid glides over the paper, it pierces it on the level of the negative point, and leaves on its surface a long sinuous train. On making the experiment in vacuo, a much wider spot is obtained, but it is scarcely visible on account of the diffusion which the electric fluid acquires.

From what has preceded, may be deduced an equally simple and infallible means of obtaining electric pictures, which I call *Electrographs.* The principle consists in multiplying the number of sparks, which impinge upon the surface of the photographic paper, following the form of a design, in order to multiply the spots which are produced. For example, on the surface of a spotted-plate, I place a sheet of *dry* paper, prepared with bromide of iodide of silver, and I retain it by means of a glass plate slightly pressed against it. I then pass the discharge of a powerful Leyden jar along the metallic ribbon; each solution of continuity is marked by a spark; and spots are formed on the paper at all the corresponding points. A very exact representation of the design which is traced on the plate, is thus obtained.

The impression of electric sparks produced with all their sinuosities, the new system of electographs which are the result, and the rapid discoloration of sensitive papers by the electric fluid, which passes from a point, are experiments which appear to me deserving henceforth of a place in the series.

POTASSIUM AND ITS COMPOUNDS.

This is the metallic base of potash; its specific gravity is 0.865. It is hard and brittle at 32° Farhn.; soft and maleable at 50°; fluid at 150°; and is volatile at a temperature below red heat.

Potassium was discovered by Sir Humphrey Davy, in 1807, by exposing to the action of a galvanic battery pure hydrate of potassa; by this means the potassa was decomposed, the oxygen going to the positive pole, and the metal and hydrogen of the water to the negative Gay, Lussac, and Thenard obtained it in much larger quantities by bringing fused hydrate of potassa in contact with iron turnings heated to whiteness in a gun-barrel.

The iron absorbs the oxygen of the potassa and water, a small quantity of the potassium escapes with the hydrogen, but the greater part of the metal is collected in a cool receiver, united to the gun-barrel.

M. Curaudon obtained it by mixing dry carbonate ef potassa with half its weight of charcoal, and exposing the mixture to a very powerful heat in an iron vessel. M. Brunner decomposed potassa in the same way, but with the addition of iron filings to the charcoal; by this plan 140 grains of potassium may be obtained by exposing a mixture of eight ounces of fused potassa, six ounces of iron filings, and two ounces of charcoal in an iron bottle to a great heat. Wöhler obtained potassium by submitting cream of tartar to a red heat in a close crucible; in this process a calcined carbonate of potassa is obtained intimately mixed with charcoal from the decomposed tartaric acid.

Potassium obtained by any of these means generally contains, according to Berzelius, a small admixture of carbon, to free it from which it must be redistilled from an

iron vessel, and collected under naptha, a fluid substance containing no oxygen. Potassium must be preserved in well stopped bottles, containing some of the same fluid, to prevent it from the contact with the atmosphere.

The principal character of potassium is its great affinity for oxygen, abstracting it from all bodies containing it. To show this peculiar property, and the phenomena accompanying its action, in some instances it will be only necessary to put a small piece of the metal into a basin of water; part of the potassium will immediately combine with the oxygen of part of the water forming potassa, whilst the hydrogen of the decomposed water will unite with the other portion of the potassium, and form a very combustible compound, the potassuretted hydrogen, which takes fire and burns with a beautiful rose colored flame. The same action takes place when potassium is placed upon ice.

If a small piece of potassium be put upon a piece of red hot iron, it will immediately take fire, combining with the oxygen of the air, and be converted into the peroxide of potassium, an orange colored substance, which will effervesce when water is poured upon it, being converted into potassa, and giving off a portion of its oxygen.

Bromide of Potassium.—This compound is a valuable agent in photographic manipulations. When spread upon paper previous to the washing of nitrate of silver, it gives a fine rich tone to a picture of exceeding sharpness. It is undoubtedly the very best preparation that can be used for copying engravings or drawings, either by overlaying the prepared paper with the original, or by means of the camera. The following is the method of preparing the paper and producing the copy. In its simplicity lies its great charm. To Mr. Robert Hunt do we owe this valuable discovery.

Paper Daguerreotypes.— Place the paper carefully on some hard body, and wash it over on one side, by means of a very soft camel's-hair pencil, with a solution of 60 grains of bromide of potassium in two fluid ounces of distilled water, and then dry it quickly by the fire. Being dry, it is again to be washed over with the same solution, and dried as before. A solution of nitrate of silver (120 grains to an ounce of distilled water) is to be applied over the same surface, and the paper quickly dried in the dark. In this state the papers may be kept for use. When they are required the above solution of silver is to be plentifully applied, and the paper placed *wet* in the camera, the greatest care being taken that no day-light—not even the faintest gleam—falls upon it until the moment when we are prepared, by removing the screen, to permit the light, radiated from the objects we wish to copy, to act in producing the picture. After a few seconds the light must be again shut off, and the camera moved into a dark room. It will be found, in taking the paper from the box, that there is but a very slight outline (if any) yet visible. Place it aside in perfect darkness, until quite dry; then place it in the mercurial vapor-box, and apply a very gentle heat to the bottom. The moment the mercury vaporizes, the picture will begin to develop itself. The spirit-lamp must now be removed for a short time, and when the action of the mercury appears to cease, it is to be very carefully applied again, until a well defined picture be visible. The vaporization must then be suddenly stopped, and the photograph removed from the box. The drawing will then be very beautiful and distinct; but much detail is still clouded, for the development of which it is only necessary to place it cautiously in the dark, and allow it to remain undisturbed for some hours. There is now an inexpressible charm about the pictures, equalling the delicate beauty of the Daguerreotypes; but being still very susceptible of change, it must be viewed by the light of the taper only. The nitrate of silver must now be removed from the paper, by well-washing it in soft water, to which a small quantity of salt has been added, and it should afterwards be soaked in water only. When the picture has been dried, wash it quickly over with a soft brush dipped in the warm solution of the hyposulphite of soda, and then well-wash it for some time in distilled water, in order that all the hyposulphite may be removed. The drawing is now fixed, and we may use it to procure positive copies, many of which may be taken from one original.

"The action of light on this preparation does indeed appear to be instantaneous. The exquisite delicacy of this paper may

be imagined, when I state that *in five seconds*, in the camera, I have, during sunshine, obtained perfect pictures; and that, when the sky is overcast, *one minute* is quite sufficient to produce a most decided effect.

"This very beautiful process is not without its difficulties; and the author cannot promise that, even with the closest attention to the above directions, annoying failures will not occur. It oftens happens that some accidental circumstance (generally a projecting film or a little dust) will occasion the mercurial vapor to act with great energy on one part of the paper, and blacken it before the other portions are at all affected. Again, the mercury will sometimes accumulate along the lines made by the brush, and give a streaky appearance to the picture, although these lines were not at all evident before the mercurial vapor was applied. I have stated that the paper should be placed wet in the camera: the same paper may be used dry, which is often a great convenience. When in the dry state, a little longer exposure is required; and instead of taking a picture in four or five seconds, two or three minutes are necessary."

In using this preparation without the aid of the camera, the same difficulties do not occur, and it works with much more certainty. In this process the following directions may be observed:

After preparing the photographic paper as above directed, render your engraving or drawing transparent as possible by varnishing or oiling it over with the purest white varnish or linseed oil; when dry, put it over the photogenic paper, which should previously have been placed on a very level board, with the printed surface upward and cover them with a thick piece of plate glass; submit them to the action of the light, for about ten or twenty minutes—according to the strength of the light. This gives you a negative picture. Fix it in the usual way; after which you make any number of positive pictures from this negative by varnishing it and placing it over the prepared paper as in the first instance.

Iodide of Potassium.—This is made by exposing to heat in a glass tube, iodine and potassium; or you may add iodine to a hot solution of pure potassa until the alkali is neutralized; then evaporate to dryness, and expose the dry mass to a gentle red heat in an iron crucible, then dissolve out the salt, evaporate and crystalize.

"Pure iodide of potassium, in powder, is totally soluble in water or alcohol. It alters the color of tumeric but very slightly if at all, and it does not discolor litmus paper. Subjected to heat it loses no weight, and it is changed to a blue color by a mixture of sulphuric acid and starch.

"Ten grains of this salt should decompose 10.24 grains of pure nitrate of silver, the precipitate is partly dissolved by nitric acid and partly altered in appearance, which is not the case when ammonia is added."

A few drops of chloro-chromic acid added to a strong solution of potassium, renders it a tolerably good photographic sensitive for the daguerreotype plate. Without the addition of potassium with chloro-chromic acid the latter produces no image on the plate.

Cyanide or cyanuret of Potassium.—This compound is made by adding hydrocyanic acid in excess to a concentrated solution of pure potass, and evaporating until crystalization commences; then pour it into a porcelain vessel and fuse at a red heat.

"When pure this salt is colorless and odorless; when exposed to the atmosphere moisture is absorbed, and it acquires the smell of hydrocyanic acid. If it effervesces with acids, it contains carbonate of potassa, and if it be yellow it contains iron."

Cyanide of potassium is extensively used, in the Daguerreotype process, for forming a silvering solution for galvanizing plates. Directions for making these silvering solutions may be found on pp. 113 and 114, *Phot. Art-Jour. for February*.

Phosphuretted Potassium is made by gently heating phosphorus with potassium. A compound formed of certain proportions of this salt with chloro-chromic acid may possibly be an agent for the production of daguerreotypes in color.

THE AMERICAN ART-UNION—ITS BULLETIN.

BY J. K. FISHER.

The manner in which this institution, "established for the promotion of the fine arts," performs its functions, must often excite the surprise of those, if any there be, who believe that "it is managed by gentlemen." And the readers of this Journal, who have read the notice of it in the Bulletin for April, must have been struck with the aptness of the method it has adopted to aid one artist, the writer of this, in selling his pictures, namely, by publishing to all the readers of its eighteen thousand copies a statement that the Art-Union had declined to purchase those pictures. Respectable tradesmen regard it as discourteous and unfair, for them, to proclaim a mortifying or disparaging circumstance of this nature, even when it has actually occurred; but gentlemen, as they call themselves, take a different view of what accords with *their* dignity, and do not hesitate to declare that they have "declined" an artist's works, even when those works were never offered to them, and could not have been purchased without violating their constitution. And even this latter reason for "declining," which might possibly have been operative with some of the committee, had there been an offer at all, or a consultation about purchasing—this constitutional restriction, which mere honest and well-mannered men would have mentioned, to soften the rigor of a rejection, had they made one, these men of high breeding, who advertise themselves as "gentlemen," do not discredit their breeding by noticing at all. Such is the mystery of greatness, incomprehensible to the ordinary mind.

And not content, by any means, with this characteristic expedient—characteristic of the peculiar gentility of those princes and great men who exercise dominion and authority over artists and friends of art, and control "the promotion of the fine arts in the United States,"—not content with this expedient to prevent an artist who will not worship, and receive their mark, from selling his works at all, or getting a commission even for a portrait, if they can help it; these delicate encouragers of art and artists facetiously representh im as follows:

"This magazine (the Photographic Art Journal of February,) has two articles devoted to the American Art-Union, which we cannot resist the temptation of noticing, although we depart thereby from a rule to which we have generally adhered,—that is to disregard all attacks which from their source or their character can do the Institution no possible harm.

"The first of these was written by an Ishmaelitish friend of ours, whose hand seems to be against every man, for he attacks Art-Union, National Academy, and Artists' Association, with equal pertinacity. The Art-Union, however, is evidently his pet target. He began to favor the public with his views upon the true mode of encouraging art in America a year or two since. He attracted less attention by his articles than his zeal and perseverance deserved. On this account probably his tone, which at first was subdued and polite, has grown of late extremely savage. He commenced his career with all the gravity and decorum of Don Quixote when he set out on his adventures, but finding that nobody seemed to admire his Dulcinea, and acknowledge her superiority over all other Dulcineas, now puts his Rosinante into the most ferocious gambadoes and curvettings, and shakes his lance in a way to terrify innocent beholders. The only persons at present against whom he is not running a tilt are the managers of the New England Art-Union, to whom we respectfully suggest that they should at once purchase his copies of the Venetian master-pieces, which the American Art-Union had the misfortune some time since to decline."

We have here the dictum of this authority to certify, that the source and character of these articles are such that they can do the institution no harm. And such appears to have been the source and character of a great many articles, nearly all that were written against the Art-Union last year, for they were disregarded by the Bulletin, and noticed only by papers edited by members of the committee, or

mollified by profitable advertisements of two and a half columns in length. As to the harm these articles may have done, we do not venture an opinion; but when an institution, instead of an increase of twenty-five hundred, finds a decrease of twenty-six hundred and fifty, at the end of a year, it may be doubted whether that difference is owing to the *talk*—not action—of the committee "to prevent a too rapid increase of subscribers" to "distress in manufacturing districts," "the delay of agents," &c., &c., &c.; it may be suspected that attacks, whatever their source and character, which are retorted by elaborate efforts to represent their authors as unworthy of notice, Quixotes, and quarrelsome Ishmaelites, and men of talent so infinitely small as not to merit the patronage of the Art-Union,—it may, by men whose humble capacity does not comprehend the loftiness of peculiar gentility, be with some plausibility conjectured that these disregarded attacks had their share in the difference of near six thousand, between what the actual number of subscribers was, and what it would have been had the former ratio of increase been maintained. And not the less probable does this view appear, when, in addition to an unusual openness in publishing a refusal to purchase, in such a way as to do the utmost to prevent others from purchasing, it appears that the whole story about the refusal was what common tradesmen would call a lie, but what, of course, the lordly and high-minded oligarchs of the Art-Union consider as not too severe a penalty for what they represent as a merely quizzable offence.

As to the assertion, that this Ishmaelite's hand is against every man, and there great institutions besides, it is somewhat less destitute of truth than the stupid pretence about declining; but it is a falsehood in intent, to represent me as inimical to any good institution. As to the National Academy, the very existence of the Art-Union in itself is a stigma upon it; the existence of the Artist's Association is a stigma upon it; had the Academy acted with enterprise and justice, and respected the liberty of taste, neither of those institutions would have been called for, or brought into existence, nor could they have maintained themselves for a year had a caprice of visionaries forced them into galvanic semblance of life. As to the Artist's Association, one could not consistently oppose the Art-Union without opposing that; it is the same nearly in principle, and differs only in the personnel. It declares that under the management of the Art-Union Committee the picture-prize system produces outrageous oppression and evil; but under the direction of the high-minded and intelligent members of the association it will re-invigorate the dying art, and so on. Now, I have merely said that I do not think the difference in honor, taste, or connoisieurship, between the two sets of oligarchs, self-elected and elected by the body of artists, is not worth examining or finding out, since the sum of both is shown by flagrant evidences, to be so small as to be inadequate to the function of directing public taste, and dispensing a monied power of eighty thousand a year, more or less.

The Bulletin next goes on to state, that I began to write about art a year or two since. I began a dozen years since. It says, that at first my tone was subdued and polite, but that it has grown savage. When I began to discuss the project of a junction of the New York Gallery, the Academy, and the Art-Union, it was not a time to tell them of their faults; moreover, it was not until months afterward that I knew much about the management of the Art-Union; I had been five years abroad, and near a year in Boston, and but a few months in this city since my return from Italy when I wrote the articles alluded to, speaking as favorably as I could of the parties whom I wished to bring into harmony and co-operation. Some months afterward a brother artist showed me some articles signed *Crayon*, in the Evening Post, which represented the Art-Union in a light that surprised me. I at once said that such charges ought to be inquired into, and proposed to write to the correspondent of the Post, under cover to the editor. The correspondent—I do not know why I should not name him, it was Mr. T. W. Whitley—promptly called upon us, and expressed his wish to have a committee to examine and report upon his charges. A meeting was called, and a committee appointed, of whom I was one; and, in fulfilling my duty as a member of this committee, I first learned that the talent for business which I had supposed the commitee to possess, was such

as would have ruined any concern that did not live by begging; and that their whole conduct was such as ought not to be tolerated in the direction of a liberal institution. It was time that my tone of politeness should receive a tinge of severity; it did so, and hence the elaborate attempts of the Bulletin to quiz and wither in one breath, and all that without descending from its stilts.

The Bulletin next displays its delicate wit in the clever use it makes of Don Quixote and his Rosinante, all with the funny intent of annihilating me by saying something fine. I am Quixote because I attack great institutions three at a time. Well, the world will not lack variety; at least the editor of the Bulletin will not commit any such imprudence as an exaggerated notion of chivalry might tempt one less discreet to fall into. Among the eighty-six or seven artists who are arrayed against the Art-Union he selects the one "whose hand seems to be against every man," and is therefore not likely to get much help; and against him he directs the shafts of his wonderful wit, and the power of his Bulletin to establish at once his reputation as a cypher in art, whose copies are unworthy to be purchased even by the Art-Union—that is, the *American* Art-Union, though he facetiously counsels the New England Art-Union to buy them. A prodigy of cleverness and humor is this editor, who says, that an institution that was allowed to purchase only originals, would not buy copies; and then recommends their purchase by another institution that is not allowed to purchase any pictures at all.

Finally, the Bulletin says, "the only persons against whom he is not running a tilt are the Managers of the New England Art-Union." This is not true. I am not in any manner opposing the New York Gallery, nor the Philadelphia Art-Union, nor Williams & Stevens' picture salerooms, nor any concerns but those it has named. On the contrary, I have repeatedly expressed my wish that the friends of art would subscribe to the Philadelphia Art-Union; and, if I have of late been more solicitious for the N. E. Art-Union, it is because it is new, and because I know that the men who direct it are gentlemen, in the true sense of the word; and am fully confident that they will not domineer, and dictate, and calumniate, and make false pretences about the value of their prints and paintings, and puff the servile daubers who submit to them, and declare that the country produces no better works than theirs, and that all who are not their loyal subjects are of no account at all, and that they have "declined" their works. Such a line of argument, affecting to despise their opponents, yet covertly stinging them with envenomed sneers and lies—such blackguardism the Managers of the New England Art Union cannot possibly commit, because they are gentlemen. Edward Everett, Henry W. Longfellow, Franklin Dexter; has anybody heard of them? does anybody want a better guarantee? I feel assured that the considerate lovers of art will withdraw their patronage from an institution managed by snobs, and confer it upon this really liberal institution, which, being fully authorised by the Legislature to draw its lottery, is conducted by unexceptionable managers.

GEORGE S. COOK AND THE DAGUERREAN ART.

BY REV. A. D. COHEN.

In giving to the public, a sketch of the life of the distinguished Southern Daguerreotypist, whose portrait adorns the present number of this Journal, we may date the commencement of his career in the city of New Orleans.

After several years of mercantile pursuits, in which he was unsuccessful, owing to the want of congeniality of taste, in the year 1843 he visited the "Crescent City," and while there, became intimately acquainted with several artists. As he watched the canvas glowing into life by the magic touch of the pencil, there arose in his breast a strong desire to imitate their efforts, and he determined to be an artist. He began to paint, and had the happiness to see his first effort succeed, which was praised and admired by those who examined it. All looked upon this maiden-piece as the promise of future honor and reward in his profession.

Among his intimate friends in New Orleans were Mr ———, since more extensively known from his connexion with "The Ladies' Wreath," published in New York, and Dr. B. ——— now an eminent physician in Mississippi. These gentlemen had been operating for some time together in New Orleans in the Daguerreotype art, and with considerable success. Mr. Cook often visited their gallery to observe the effect of light in their pictures, and to receive a few lessons from the hand of Nature as her delicate pencil portrayed the beautiful folds of drapery in all its rolling richness, so difficult to fix upon the canvas with any degree of truth. At this period he changed his mind in reference to painting; not that he had lost his desire to become an artist, which still burns in his bosom, or that he had not met with sufficient encouragement by his success, for this was unabated, and that was flattering in the extreme, but from a want of means to enable him to prosecute his studies for a sufficient length of time to perfect himself.

Having been favorably struck with the beauty of Daguerreotypes, his idea was to undertake the practice of this art in connexion with the other. This he suggested to Mr. ——— and Dr. ——— who encouraged him, and he began to operate in their rooms. The rapid progress he made realized their anticipations, and bringing to his aid the best taste in the arrangement and position of his *sitters* (?) it was evident to them that he must soon take an elevated position among his brethren. An arrangement was at once entered into, by which Mr. Cook assumed the entire charge of their rooms, and this gallery immediately took its stand at the head of the profession in that city.

The great object which Mr. Cook now contemplated was to bring the art as near perfection as the then limited knowledge of Photography made it possible. He determined to push onward and bend all his energies to the accomplishment of his design. He felt that this beautiful art *could* be elevated to the high standard of its sister arts; and by his indefatigable exertions and innumerable experiments he soon had the pleasure to realize the reward which Patience, Perseverance, and Energy, always bestow upon their faithful votaries.

After operating in New Orleans for several years with the greatest credit to himself and giving general satisfaction to the numerous patrons who thronged his rooms, he determined, if possible, to establish a gallery of the highest order and on the most extensive plan in connexion with a gallery of the best paintings of the best artists of this and other countries. Accordingly he entered into a negotiation for Mr. Cook's celebrated gallery of paintings then established in New Orleans, but having failed in consummating his arrangements to his satisfaction, he determined upon a tour through the country.

With characteristic energy, the plan was no sooner conceived than preparations were made to enter upon its accomplishment. He travelled through the States of Mississipi, Alabama, Tennessee, Missouri and Georgia, operating, as he went, with his usual success and establishing galleries in many of the principal cities and towns of these States, teaching pupils, and when they were sufficiently advanced leaving them in

charge of these rooms, thus spreading his fame throughout all the Southern cities, towns and villages. As we glance at his career we are compelled to believe that he deserves all that patronage which a discriminating public has bestowed, as well as the thanks of the profession, for having, in these sections of the country raised the art to its proper elevation, for it has been the policy of Mr. Cook, since he began to impart to others a knowledge of art, to refuse all whose connexion and character did not warrant him to hope that they would be an ornament to the profession. Thus he numbers among his pupils many young men from the first families; some pursuing the practice of the art from mere desire to be occupied in some useful employment, and others choosing this as the profession best adapted to their taste and circumstances.

While Mr. Cook has been thus particular in choosing his pupils and thus guarding the profession from unworthy characters, he has never turned from his studio the *poor* young man who has brought with him a good character and promising talents, and there are many such through the country who reflect much credit upon their preceptor by their success in the art, and who gain for their families *that* support which they could not otherwise obtain. It is true there have been some disappointments, as will happen in every sphere of industrial and professional pursuits, but upon the whole he can point to many, who, benefited by his instructions and encouraged by his patronage, bid fair to take their stand among those who occupy the most elevated position. We feel confident, that the public in the South will sustain the assertion, that no man has added more influence to the elevation of this art to its true dignity and beauty than Mr. Cook. The character he sustains for urbanity of manners and pleasing address, his unwearied patience in pleasing every one who may come, gain for him general esteem, and the superiority of his pictures commands the almost universal preference whereever he has operated. There is a style in the mind of every operator which he prefers and for which he strives.

The style which Mr. Cook has adopted is peculiar to himself, and, so far as we have had an opportunity to judge, the best; and we have seen specimens of many operators, embracing works of the best artists in New York, Philadelphia, Boston and the Southern cities.

He alone, of all that we have seen, seems to possess the art of finishing with the pencil so as to give the almost exact appearance of the color of the flesh, and such is the peculiarity of the tone of his pictures thus finished, that all the tints and shades of the complexion seem to be truthfully represented; we can scarcely imagine anything more true to nature. Such is the admirable blending of his flesh colors and the beauty of his drapery, presenting faithfully every tint in the colors of the dress, that one in looking upon some of his highly finished specimens is led to believe that there is no room for improvement.

While all others have been striving to imitate the dark sombre tints of an engraving, and made that their standard of perfection, he has sought with as much zeal to fix, as near as possible, the glowing tints and rich shadows of life itself, so that his pictures differ very much in this respect, from those which we have seen of the best operators in this country; while we look with pleasure upon these as far surpassing in beauty and richness of tone the most exquisite steel engraving, we gaze upon the other as we would admire the best and most highly finished miniature from the studio of the best painter.

After travelling through most of the Southern States, he determined to visit Charleston, S. C., and he is settled here at the time of writing this.

Having satisfied his mind that the perfection of the daguerreotype depended much upon the quality of the light, he has endeavored to improve upon every room he has established by a different arrangement of the medium by which the rays of the sun are admitted. He has at last succeeded in obtaining one of the best arranged "lights" in this or any other country. In order to accomplish this he has spared no pains or expense, and has expended incredible sums in his various experiments.

There are many interesting circumstances which might be noticed in the history of Mr. Cook illustrative of the principle, that when outward annoyances threaten to impede one's advancement in the prosecution of an enterprise, energy, boldness and perseverance will enable him to overcome

all difficulties and arrive at that position, which others, more timid, fail to reach. But however interesting these facts might be to him who writes this, we withhold them here, conscious that the Daguerrean world would prefer the course we have taken. We give a sketch of Mr. Cook's life only so far as it relates to the Photographic Art.

In conclusion, we would state that we have heard many operators complain of the uncertainty of their operation at certain times, not being always able to procure equally clear and perfect images upon the plate. This happens more generally before a storm.

In speaking to Mr. Cook of this, he gives it as the result of his long experience and faithful observation as to this point, "that this is owing to the want of electricity in the light or atmosphere, and that if the operator would go on and obtain as good pictures as he can, he must *wait for a few hours* and the same success will ensue as before this difficulty occurred. *Instead of beginning to* "FUSS" *with the chemical boxes and change and alter with like results, let patience enable you to wait but for a short time and all will be right again.*"

We most sincerely hope that Mr. Cook will give us his own views on this important subject, in the "Journal." We are sure the Daguerrean world would be gratified as well as instructed by the *practical* results among those of the first class of operators in America.

THE HISTORY, PLAN, AND POSITION OF THE AMERICAN ART-UNION.

[As we have given place, in former numbers of our Journal, to strictures on the conduct and management of the American Art-Union, we deem it no more than proper to publish the following article from its Bulletin for April. It, of course, exhibits the brightest side of the picture, and due allowance must be made for the source from which it eminates. The Bulletin's reply to Mr. Harrison's strictures already alluded to are too coarse to deserve a rejoinder from *us*, further than to correct some errors which crept into Mr Harrison's article, which we shall do in our Gossip.—*Ed.*]

THE example of the London Art-Union in the Fall of 1838 suggested to a few gentlemen in New York the possibility of doing something for art in a similar manner in New-York. It was obvious to all that it might not be practicable to do here what was easily done in London, the great metropolis of an old compact and populous nation, with its schools of art, its artistic history and renown, and its artistic monuments; with its great public galleries, and annual exhibitions of modern art, and its population of 1,500,000 addicted to the most expensive gratification of their cultivated and refined tastes. In spite of difficulties and doubts, it was, however, finally determined that an effort should be made to form an association that should have for its purpose the patronage of artists and the cultivation of the people, by good artists, ancient and modern; a permanent gallery, and the annual purchase of American works of art, to be distributed among the members of the association. The funds were to be provided by the receipts at the exhibitions, which were to be free to members only, and by annual subscriptions of five dollars; each subscriber indicating whether his means should be devoted to the purchase of pictures for distribution, or for a permanent gallery; those contributing to the permanent gallery having no share in the distribution.

The association, under the name of the Apollo Association, commenced its career with high hopes and encouraging zeal. The purchase of paintings for distribution was by its first constitution the primary object, and the production of an engraving was contingent and secondary. It was soon found, however, that few subscribed to the

permanent gallery, and that there was danger that the mere purchase of a few pictures and the distribution of them by lot, would be so much like a lottery as to be offensive to many good citizens, if not to the laws, —would be sustained by a spirit of gambling rather than the love of art—and that it could not be highly useful, nor hope for continued success.

It was accordingly determined, after one year's experience, to submit the institution to the Legislature, by a request that it might have the sanction of law, which was given by an act of incorporation in 1840. It was also determined that after a suitable amount of the funds should be invested in paintings for distribution, an engraving should be produced of which a copy should be given to every member.

The exhibitions, while they were all that we desired in character, greatly dissappointed us in the receipts ; and our funds, small at best, were so diminished by expenses that little was left to be divided between even a cheap mezzotint engraving and the purchase of a few paintings. The country subscription did not increase, and the city list was with difficulty kept up. Convulsive but ineffectual efforts were made to rally the people and the public press in favor of the institution. The committee of managers at their own expense prepared a costly entertainment, to which the press and the friends of art were invited, that, being brought together, their sympathies might be excited in favor of art. Not one soul came to cheer the committee in their thankless labor ! Their pictures for distribution were only six ! The committee was discouraged, and at the next annual election they declined to be re-elected, with the exception of one or two, who still had faith that there was there a germ which was destined to bourgeon and to grow, and they, together with their new associates, determined that a vigorous effort should be made to infuse new life into the institution ; to give it a name and character, and usefulness, which should make it in the best sense a national institution ; and they never doubted that they should sooner or later, succeed.

It was resolved to abandon the exhibitions, which had cost the last year, $2000 more than their receipts. The subscriptions to a permanent gallery, which in three years had amounted to only $150, were also discontinued. Office-rent was stoped, and for a time we were indebted to the public spirit of a popular and liberal bookseller (Mr. Francis), who allowed the committee gratis to hold their meetings in the literary parlor of his bookstore. Each member of the committee pledged himself to procure by personal solicitation a certain number of new members, and thus, with our saving, a real increase of funds to the amount of near $4000 was made. We therefore resolved to give to the subscribers, instead of a meagre mezzotint print, a fine line engraving.

The new zeal of the committee, further economies, and the brightening prospects of the institution, greatly extended its influence, and as a first step towards that complete success to which they looked, and to give to the institution a more national air, its name was changed to that which it now bears. And under the name of the American Art-Union all the efforts of the committee have been directed to making it in every respect a National Institution, adapted to the feelings, tastes, and circumstances of the people, and appealing to their national pride and sympathies. From that time to this the public favor has given us its annual reward, and by a rapid and unexampled growth its income has risen to more than $80,000.

As the members had always been assured in our annual publications, so the result has shown that as our members have increased so have our benefits, in a still greater ratio. The certain returns to every member have been multiplied threefold, while his subscription has been the same ; and our beneficial influence upon American art has even more increased. Our thousands of members now swell our lists, that they may have these annual certain returns —their contingent interest in the distribution, is but an incident to the working of a certain and regular system of permanent and equal benefits.

It is interesting to contrast the present with the past, of only ten years ago. Then our only local habitation was the bookseller's office; next came a small office, in which a few pictures were hung, as they were purchased ; and from that has come by steady gradation, our present galleries, and offices, and store-rooms, making an aggre-

gate length of 360 feet, and of the width of 25 feet, devoted solely to our business and pictures.

Necessity, then, compelled us to give up the exhibition of paintings, one of the greatest means of improving and cultivating the public taste, and of encouraging and teaching the artist himself; now our long galleries are filled with the best productions of modern art among us, with many of the choice works of the foreign schools, and night and day they are thronged by thousands from all parts of the country, who come and go at pleasure, without charge.

We then gave to each member a small and cheap mezzotint print, now we give to every one a large, expensive and valuable line engraving—an honor to art anywhere; and five smaller ones, each one of which is worth more than some produced by the London Art-Union in its most prosperous year,—to be continued annually as a gallery of American art.

As the members and others began to look into our office, to look at our pictures, a small catalogue was printed on a slip of paper for their convenience, and that has grown to be our present Bulletin,—a valuable literary Journal, devoted to the cause of art, containing the transactions and business of the institution, and made interesting and valuable by numerous illustrations, which is furnished gratis to every member.

In addition to these returns to our members, scattered throughout the whole nation, and doing, no one can tell how much good to the cause of art, think of what we have done otherwise! How many engravers we have employed, and what stimulus we have given to that beautiful art among us. Medallurgy was unknown here; now beautiful medals in honor of heroes and statesmen and artists, the pride and glory of the republic, are produced only since this institution took the responsibility of encouraging—of establishing indeed—in this country that ancient and interesting branch of commemorative art. And we are now doing the same for another ancient branch of art, in employing the best talent that can be obtained to produce original bronze statuettes.

Without the purchase of paintings, painters must seek other employment or starve; there can be no. galleries, no exhibitions, no artists. In 1841, the institution purchased six pictures and one bust, costing together $1059! Last year we distributed 500 paintings and statuettes, and 500 medals, costing $43,120; and the institution has purchased works of art since its organization from 257 artists, residing in 45 different cities and towns, and in 15 different States of the Union.

One of the best means of encouraging American art is to give to our artists the means of studying and practising their art in the midst of the productions of the great masters of other lands, that they may come back loaded with the spoils of time in that cultivation which ministers to our instruction and gratification, and contributes to the national glory. During the brief period of our existence—a large part of which was a mere struggle for life—we have paid more than $17,500 for the works of American artists abroad—to twenty-eight artists from the cities of Boston, Hartford, New-York, Buffalo, Philadelphia, Baltimore, Cincinnatti, Washington, and Mobile.

All this general benefit, this promotion of the fine arts in the United States, is an immense patriotic gift to the nation from the members of this association within the last twelve years; and what has it cost them? At first, we were compelled to admit that our members must make sacrifices to promote the cause of art in joining this institution; now, it is not too much to say that each of the three dividends to all the members—the Large Engraving, the five numbers of the Gallery of American Art, and the Illustrated Bulletin, are each worth the five dollars paid for all! saying nothing of the free galleries, and the share in the distribution, which to many members are of no value. The committee are themselves amazed at the success which has rewarded their labors. From one end of this great nation to the other—on the Atlantic and the Pacific—from the Gulf to the Lakes—there is hardly a city or a village that through this institution has not practically an Art-Union of its own, which employs the best artistic talent, collects the choicest American productions of the burin, the chisel and the pencil; the literary varieties, and the appetising goss p of a large Art-Journal, and

delivers them all at the doors of its members! And in all the great foreign schools there may be always found deserving artists who look for a part of their support to the American Art-Union. Our original purpose has been more than threefold accomplished.

This success has been an exceeding great reward, and has more than compensated us for the attacks which envy and malice and disappointment have directed against us, and which have hitherto been harmless. In the early days of the institution, when it was not easy to find paintings in which to invest our little funds, we bought everything at the highest price; we then gave no offence to artists but we soon stimulated production, so that we were overwhelmed with the trashy productions, which our own action had called into being; and it began to be doubted, in the committee-room, whether we were not doing more harm than good. Discrimination was necessary, and a more fastidious regard to actual merit. Our readers need not be informed how soon and how angrily artists of no merit complained of us for buying the pictures of those who had little merit and the less labored productions of those who had much merit. The committee make no pretensions to infallibility, and have often knowingly, and, as they believe, wisely, purchased paintings of little merit, but a glance at the loads which they have been compelled to reject, has always been enough to vindicate the action of the committee in this regard so far as reasonable persons are concerned. But the unreasonable and the malicious have in some instances caused their attacks to be published hundreds of miles from us in newspapers that we never see, and where the character of the committee is not that complete protection which it is here, where they are known.

They have attacked our expenses—the gross amount of which is large, and to many may seem enormous, but to those who are familiar with such operations, they are not large. A business with near 1000 agencies, collecting an income of from $75,000 to $100,000 in sums of five dollars; whose postage account, even at the present rates, is more than $1000 a year; which must keep in constant employment most reliable and trustworthy employees; which must print and advertise extensively; and must put up and dispatch thousands of monthly Bulletins and pamphlets, and hundreds on hundreds of boxes of engravings and paintings for every part of the nation,—cannot be carried on with small expenses.

They have attacked our management; they have said the business is managed by a *clique*—a popular word often used without meaning, and without cause. If it means that in the committee of management there are some who give more attention to its business than others; it is undoubtedly true of this, as of every other institution; but when we say that during the twelve years of it existence it has had five presidents, six treasurers, four corresponding secretaries, six recording secretaries, and seventy five-members of a committee of twenty-one, it will be seen that rotation in office has given as much change as is consistent with good management.

And the plan of the Institution, which has been so successful, has also been made the subject of complaint by some, who insist that the plan of the London Art-Union should be adopted. That institution, it is well known, differs from ours in this, that it distributes by lot, sums of money of unequal amount, subject to the condition that they be invested in paintings on exhibition in one of the great exhibitions in London, at the artist's price. If the amount be less than the price of the picture, the difference must be made up by the prize-holder; if more, it is forfeited to the institution. This plan assumes that the prize-holder is better able to judge than the committee—(which may be true)—that his choice, thus restricted, will do more for art, than purchases by the commitee without restriction—that the committees who admit paintings to exhibition are more reliable than the committee of the Art-Union—that the artist in his studio, with his partiality for his own works, is better able to fix their price than others, who are familiar with the works and the prices of all—it makes the institution, so far as encouraging painting is concerned, a mere collector of money, to be expended by no one knows whom, for no one knows what. This plan is less liable to objection in such a city as London, and such a country as Great Britain.

Our Institution was incorporated, and has been studiously managed with a view to the promotion of the arts in the United States, and the whole country is actually the sphere of its influence. In any one of the 500 towns and villages of from 1000 to 10,000 people, remote from the great cities, what inducement is it to offer one chance in a hundred of having $50 cash, which must be lost unless — within a specified time — it be invested in a picture — on exhibition in some far-off city — whither the party never goes — subject to the risk of finding no picture near that price — or at any marketable price, and of having the choice made by a stranger, under no matter what influences of interest or favoritism? Nothing less than the most stringent conditions and the most argus-eyed suspicion can prevent such a system from dwindling into the most pernicious and dishonest gambling, and arrangements of collusion, misrepresentation, and downright fraud? and if the fortunate (?) holder of a prize should be permitted to spend his money, at his discretion, with any artist, for any pictures, how much of it would not go for family portraits to the nearest and cheapest painter of portraits? How much of it would go to any beneficial purpose of promoting art in its proper sense? How much of it would go to strengthen the timid steps of the friendless son of genius in his early studies? How much to minister to the necessities of meritorious but unknown strangers? How much to stimulate the highest efforts of art among us? How much to sustain the self-reliant and ambitious young American that, depending upon his pencil for bread to eat, and raiment to put on, has gone to find in the academies and instructions of foreign schools and studios the means of his highest cultivation, and his surest contribution to his country's glory?

It is easy to say that a sum may be set aside to support artists abroad, but will our members agree to it? Who shall select the beneficiaries, and when chosen, will they go as charity scholars? Will they do honor to our choice, or will they make our bounty a means of foreign travel simply, and come back with a little broken Italian — the mustachio — the affected voice and the mincing gait of a carpet dandy, to arrogate superiority over their fellow-artists, who have nothing but their merits to recommend them. Is it not better to do as the American Art-Union does, allow them to support themselves by their works, which can be done only by industry and study, and that deep devotion to their art which never fail to meet their reward.

On any other plan than ours, where shall we get the attractive free gallery, which can only come with a large income, and a large number of paintings annually, giving constant novelty and freshness. Indeed, the first great want in giving a national encouragement to art is a large annual income — large enough to be felt every where; to give benefits every where; to give confidence every where. Nothing less than a very large income can ever give to the members a large actual return for their contributions, after giving to art an encouragement fourfold greater than the same amount of money could give in many separate amounts, all devoted to the same object. The secret of art-union encouragement is found in the immense economies which result from large amounts and large numbers.

To engrave and keep in order a plate for 20,000 copies, will not cost twice as much as it does for 500. The paper in large quantities at wholesale prices; the printing of engravings, which can keep a large press constantly at work, can be done at much less than for a few copies. The Bulletin with its illustrations does not cost for 20,000 copies five times as much as for 500. All that our immense establishment costs us in rent, would be required to give us room for one-quarter of our business. Now our employees devote themselves to the business for the whole year, to the utmost of their industry, and we should hardly require less if we had but half the members.

It is unnecessary to go more into detail; we have no readers whose intelligence will not suggest to them the manifold advantages which result from great numbers and the facilities resulting from the manifold conveniences of a great city.

The American Art-Union was incorporated for the purpose of promoting the Fine Arts in the United States, and it is to that enlarged and generous purpose we are to direct our efforts, and devote our means.

It is a duty requiring judgment, discretion, forecast, and review,—the adaptation of efficient means to desirable and national ends. The law, for wise purposes, it is presumed, provided that the directors of the institution should not be professional artists;—that no professional jealousies or partialities might disturb its councils, embarrass its action, fix its prices, or confine its arrangements to one art, or favorite artists, or its efforts to one mode of encouragement.

It requires a plan which embraces all the sisterhood of the fine and commemorative arts, and which cares for the promising student as well as for the artist of established reputation and popular favor, not only buying their works, but in buying also judging them, and in buying them together offering, to all —examples for study—subjects of criticism—and objects of admiration. Our plan, therefore, offers the following characteristic advantages :—

1. To all artists an opportunity and a place to present their works for sale and for exhibition.

2. To the committee, abundant means of comparison in making their selections.

3. A collection of American art, for the examination and gratification of the members and strangers.

4. To artists the means of study and comparison, which nothing less than juxtaposition can fully secure.

5. Actual purchases, by a committee familiar with the subject, unrestricted as to galleries, or exhibitions, or individuals, or subjects.

6. The best means of encouraging American artists abroad.

7. The means of furnishing to all our members a valuable art-journal.

8. It is much more popular and acceptable to the people, and thus secures a much larger amount of money.

And in addition to these, so peculiar to itself, it has all the advantages of any other plan with which the committee are acquainted.

There is yet another subject to which we must advert. Within a short period past, the institution has sometimes been spoken of as a lottery, with a view to injure its usefulness. Those who have observed our course, cannot fail to have observed that we have constantly labored to keep free from any such just imputation. As soon as we found that any of our agents presumed to treat the Art-Union as in any sense a lottery, and to lend their countenance to lotteries and raffles, little or great, the committee issued a circular to all, announcing that those who should be in any manner mixed up with such things, must withdraw from their official connexion with this institution.

One great example of disposing of an old stock in trade by lottery, which assumed a name like ours, not because ours was a lottery, but because it was not, and they hoped thus to escape the imputation and the notice of the legal authorities, was allowed to go to its maturity; and from that, and not from us or our acts or plan or purposes, sprang a kind of lottery, which has of late been too rife; and none can be more averse to such petty gambling for pecuniary gain than the committee of the Art-Union. They foresaw the evil at the time to which we have alluded, and would have prevented it, if their motives would not have been misconstrued.

Those who have read what we have here written cannot fail to see that our institution is not a lottery in any usual, legal, or moral sense. We associate for the promotion of the fine arts, a useful, national, patriotic purpose; by the economies resulting from very large numbers, we are enabled to pay all expenses; cause large plates to be engraved, taking years to engrave them, at an expense of thousands of dollars each, and to furnish a copy of the print to each member. There is no lottery in this. To cause to be engraved each year five other plates of less size, and to furnish a copy of each of them to every member also. There is no lottery in this. To publish monthly a large, valuable Art-Journal full of interesting and instructive reading, and ornamented with valuable original illustrations, and of this too, every member receives every number till the end of the year. There is no lottery in this. This is the mode in which we directly encourage the art of engraving, and indirectly those of painting, sculpture, and design, in doing honor to the works from which the engravings are made, and by disseminating every where a knowledge of art, and a taste for its better productions, which soon drives away those coarse and

abominable prints with which uncultivated taste offends the eye in places of public resort and private ornament. The committee perceive that medallurgy is unknown among us, and that from its nature, individual patronage can never bring it in, and their duty is plain to do something for it. They cause dyes to be engraved and medals to be struck, successively, of the eminent painters of our own country. Thus we build up that art directly, and indirectly encourage that of painting, by recording the immortality of those who deserve it. We do the same to sculpture in bronze, by producing statuettes. There is no lottery in this. It would, however, be a waste of the funds of the association to give a medal or a statuette to every member. The art is encouraged more, much more, by making the die or the mould, and striking a few hundreds, than it would by striking thousands. It is therefore our duty to produce but few copies, as we have always done. And, the great art of *painting*, how shall we directly encourage that? We must buy the paintings. There is no other way practicable. The artist must live by his art. It would be of no use to give him money if his paintings were to lie hid. So then, with what funds are left, after all our other purposes are answered, we purchase paintings in such manner, at such price, with such selection, and such criticism, as, under all the circumstances, will in our opinion, best promote American painting. There is no lottery in that. The Institution has thus a few hundred medals of equal value, a few dozen statuettes of equal value, and a few hundred paintings of greatly unequal value, no one of any of which is divisible, and they are the property of 16,000 persons. Shall these works of art be hidden from all eyes in vaults and store-rooms? They can perform their mission of good, only by being looked at, studied, criticised, admired; and so we exhibit them to all alike, for weeks, and months, freely. There is no lottery in that. But all cannot see them—thousands are at great distances—the encouragement of this art ought not to be confined to New York—and when these works must give place to new productions and purchases, how can they be justly and impartially scattered through the country, and made the separate property of individual members, and so long as they endure be daily ministers of taste, of instruction, and of pleasure to families and neighborhoods? They must draw lots for them, there is no other mode practicable; and there is no lottery in this. It is a partition, a mere division among the owners of what cannot otherwise be enjoyed either jointly or separately.

Lotteries are forbidden by law and morals, but no rule of law, morals, or religion, prohibits or discountenances drawing lots for the necessary and useful purpose of a just partition. The laws of New York are very stringent against lotteries, and have been so for many years, but so confident were the founders of the Art-Union that there would be no legal objection to a division by lot—and there were eminent lawyers among them—that, without hesitation, they adopted that mode, incorporated it distinctly into their constitution, published it in every mode, solicited subscriptions, and publicly performed all their operations from the autumn of 1838 to the winter of 1840, when they as confidently applied for legislative sanction, and, with that constitution in actual operation, were incorporated with ample powers to continue to exercise the same functions and to form such constitution as might be desirable. The constitution was then amended and re-adopted, with the provision that "*the works of art purchased during the year shall become by lot, publicly determined, the property of individual members;*" and the institution continued its operations in the most public manner till 1844, when the charter was again brought before the Legislature, and was amended by giving it its present national name, and enacting that "the distribution of works of art belonging to the association, provided for in the constitution shall take place on the Friday before Christmas;" thus most distinctly ratifying and sanctioning the distribution. And again, in 1847, an important amendment was made to the charter by the Legislature of that year. Thus three several Legislatures, at intervals of three or four years, have legalized our proceedings and distributions—distributions taking place annually, in the most public manner, in the presence and under the care of the public authorities, and heads of police of the cities of New

York and Brooklyn. How idle it is to say that thus created, fortified, and protected by law, we violate the prior law which provides that no person unauthorized by law shall draw any lottery, game, or device of chance, by whatever name it may be called, for the purpose of exposing, setting to sale, or disposing of any houses, lands, tenements, or real estate, or any money, goods, or things in action. And those who suppose that the drawing lots is either the purpose, or the attraction of the institution, would soon find, if it were nothing but a lottery of paintings, that instead of 16,000 members, there would not now be, and never would have been 1600 members. The quiet attractions of art are of another kind. It is they that bind together our great multitude. Taste is the angel that drives the money-changers from the temple of the mind, and petty gambling comes soonest under its whip of small cords. It has often interested us, in looking over our list of associates, to see the numbers of that gentler sex whose purer tastes and gentler influences make so much of the beauty of life—the number of the sacred ministers of religion, and of the educated classes generally, that honor our lists—and to see, by the language, the look, the demeanor, that polish of the soul that shines out to the surface, in the humble as well as the high, of those with whom our thronged galleries, our correspondence, and our business brings us in contact—and to us it seems impossible that our institution can have an immoral effect. We would as soon think the administration of justice immoral because jurors are drawn by lot, or that government should be exploded because senators and judges, and other public officers, are necessarily assigned their periods of office by drawing lots.

We have said more than we desired to say on these subjects, but the occasion of communicating with all our members seemed, under the circumstances, to call for a full historical view of our proceedings, that our true position might be known to our friends.

Fox's Galvanometer.—Mr. R. W. Fox exhibited an instrument for determining the relative intensities of electric currents. It consisted of a galvanometer in a box, the latter resting on a horizontal plate, to which it was attached by a central vertical only, and could be turned in azimuth, on the plate; its angular position being denoted by a point or index attached to the box, and a graduated concentric circle on the horizontal plate, of rather greater diameter than the box. When used, the box and horizontal plate were both turned round, so as for the galvanometer needle and the index both to point at zero. The needle was then deflected by a voltaic current, and the box only was turned, till the needle again became stationary at zero. Its position with respect to the voltaic current passing through the helix, being then always constant, the size of the angle from zero marked by the index on the base circle, indicated the deflecting intensity of the current, in relation to that of any other current similarly tested; the intensity of different currents being directly as the sizes of these angles.

When the instrument is employed to ascertain the intensity of strong currents and it is found needful to limit the amount of their deflections of the needle, a magnet attached to the box may be used for this purpose, or if preferred the method of torsion may be adopted, so that, by means of this apparatus, the electro-magnetic intensities of all such currents can be accurately compared.—*10th Report of R. Con. Polytech. Soc. p.* 25.

THE ARTISTS OF AMERICA.—WASHINGTON ALLSTON.

BY MRS. ANNA L. SNELLING.

WASHINGTON ALLSTON was born at his father's plantation in Waccaman, (all Saint's Parish,) South Carolina, on the 5th of Nov., 1779. He was the eldest son of William Allston, junior, by his second wife Rachel Moore, daughter of John Moore of St. Thomas' Parish, S. Carolina. In 1789 he was sent to Newport, Rhode Island, and placed under the charge of Robert Rogers, Esq., who after faithfully serving his country in the revolutionary struggle with the mother country found himself obliged to resort to the slavish though highly responsible and honorable vocation of instructor of youth, and established an academy for that purpose, and to the patient paternal watchfulness and christian example of this benevolent and virtuous man, may be attributed the moral and religious principles and feelings which were so prominently displayed in the character of the poet painter.

The talent for which he in after life became so celebrated, was exhibited from his earliest childhood. While quite young he used to amuse his younger brother and sister by making imitation birds from the pith and shiny part of the corn stalk, and from the recollection of one of these little birds, he composed a beautiful sonnet which he presented to his sister when she visited him at Cambridge nearly thirty-six years after! How wonderful is the freshness of memory about the incidents of childhood! and how vividly are they brought back after struggling for years with the cares, perplexities, and sorrows of life!

Drawing figures, &c., and painting them with the juice of the pigeon-berry, was also at that early period his delight. To a child of such versatile talent, and such a vivid imagination, the close confinement to the duties of a school-room must have been galling. As for Latin, Greek, and arith-

metic, they had no charms for him—especially the latter. His Virgil was embellished with drawings, and some kind of sketch was invariably found on the reverse of his sum. His slate always betrayed in what direction his thoughts were wandering. He seldom joined in any of the out-door sports of the boys, but devoted his leisure hours to drawing, and constructing small theatres, and making and painting scenery for the same, and puppets to act therein—in addition to which, he devoted much time in preparing plays for the boys in which harlequins and robbers were sure to be the most prominent characters. All the dresses, characters, and movements, &c., being planned by him. When at school he also drew and painted in water colors several small pieces. The first of his grouping of figures was a scene from the tragedy of Barbarosa, in which the splendidly robed tyrant and the slave Selim surrounded by black mutes, were introduced with much effect; he also designed and painted several scenes from the Mysteries of Udolpho, and one from the Mountaineers, in which Octavian figured. He had considerable tact for carricature, and drew one representing his French class all seated at a round table excepting one boy who was represented in the act of reciting his lesson to the master (Ducis,) and the master holding a *pig* in his hand and directing the boy to pronounce oui (*yes*) just like the noise made by the little brute. His first effort in oil painting was a copy from an old but good painting representing an irruption of Mount Vesuvius. Many of these earlier specimens he destroyed as soon as finished, as many youthful painters and poets are in the habit of treating their earlier productions, little dreaming of their future advancement.

About this period he first formed the acquaintance of Malbone, who afterwards became so celebrated as a miniature painter. Not long before he left school for the university, he painted a capital likeness of a St. Domingo black boy who was one of the house servants, whom he represented with a *Liberty Cap* on his head, ornamented with a tri-colored tassel and a cockade, and placed in one hand a book, and in the other a shoe-brush. This he took to the university about 1796.

At Cambridge, he painted an excellent copy of the portrait of Cardinal Bentivoglio, belonging to the university; and much to the amusement of the country people on their way to Boston market, the front windows of his room were painted with various figures representing Buonaparte's invasion of Egypt, and reception by the Musselman &c., and all to amuse the passers by. His love of the humorous was irresistable, although never indulged in for malicious purposes. He also, by drawings, and written incantations put quite a hoax or quiz upon the Rev. Doctor Morse of Charlestown, who was at that time endeavoring to convince the public through the papers, of the existence of a branch of the Society of Illumanti being in this country.

His predilection for theatricals was at this time very strong—so much so that he with his friend Ben Wells and others prevailed upon Hodgekinson, who was then the manager of the Haymarket Theatre in Boston, to get up Schiller's celebrated play of The Robbers—soon after which, he and others got up a masquerade, in which he figured as The Knight of the rueful countenance, and Leonard Jarvis as Sancho. A few days after, his brother who knew nothing of the masquerade, entered his room, and perceiving in his paint closet a complete suit of armor made of pasteboard, together with shield, lance, and visor, he rigged himself with them cap-a-pie and took his post near the door to defend the entrance against all intruders. It happened that the first person who entered was Jarvis who had acted in the farce—a rencontre immediately took place—when, to the discomforture of the assumed knight, he was cornered and obliged to capitulate.

At the university, Allston painted several small pieces on canvass—Damon and Musidora from Thompson, and Octavian from the Mountaineers. Upon leaving Cambridge in the autumn of 1800, he resided in Newport, and previous to his returning to his native state, he painted several pictures—amongst them were a portrait of his preceptor—also of St. Peter weeping after he heard the cock crow; and Judas Iscariot with the fatal bag. Also a beautiful head meant for our blessed Saviour—all of which he took with him to Charleston in December.

He had not a particle of malice in his disposition, but a kind of pleasant humor, which, to them who did not know him in-

timately, might have been mistaken for such. As an example, he had commenced a portrait of his friend Armand Aboynan, he had left town without its being finished; when, finding it impossible to go on without another sitting, and feeling a little mischievous, he threw a squint in one eye, and made a capital fiddler of him in the act of playing—but when the doctor (Aboynan) came to take leave and receive his likeness, we may well imagine his disappointment, amounting almost to anger. Allston placed him with his back to the picture—as he always did in such cases until it was in a proper light—and when the word was given—"Now, doctor, you may turn round," there was a violent struggle in the poor victim's mind between anger, mortification, and friendship—but the latter predominated, and they had a hearty laugh together.

Among his caricatures, was one of the French National Convention at a rasher of frogs, which his brother stuck up before his sister's piano-forte, expecting that she would see it and take it down before her French music master arrived, but unfortunately she did not; and the poor girl would have borne the brunt of the mischief—but the good-natured Frenchman believing her innocent, took it all in good part—laughed heartily and complimented the drawing.

About this time, as the family were preparing to remove to the country and the carpets had been taken up, he sketched on the floor of one of the rooms a scene from Milton, where Satan threatens to pass through the gates of hell which were guarded by Sin and Death. He afterwards made a finished sketch of this on paper.

Before we record the future career of Allston after he arrived at manhood, let us glance at his literary talents which were equally developed at an early age. Although he disliked to wade through the ordinary routine of study, and considered Greek and Latin as mere necessary evils consequent upon a complete education, yet he mastered them both—together with a perfect knowledge of the best works of his own mother tongue, with the greatest facility—and he made good use of his acquirements. His earliest efforts at composition were like his sketches, vividly tinged with that quiet humor which was one of his most characteristic traits. While at school, he wrote a doggrel in which a school-mate *parching corn during school-hours*, and the tutor, were the heroes; it was a capital scene. His next, was lampooning the author of a piece of poetry which appeared in the Newport Mercury, setting forth the great benefit that would arise to the country by the acquisition of Louisiana, but he was overheard by the author when reading it to his schoolmates, who gave him to understand that he should be punished if he dared to publish it. He also wrote a farce which was entitled, "Doctor Last's examination before a College of Physicians"—in which he was assisted by a schoolmate (John L. Boss, afterwards member of Congress) who abounded in wit and humor and wrote several scenes. He likewise got up a pantomime which was called "Harlequin in London—or King George's head in the Basket," all the scenery, dresses, &c., were designed and arranged by him; it was performed several times in the school house by the boys, greatly to the amusement of a mixed audience.

A piece of poetry which he wrote entitled "Aurora Musis Amica," was much admired—also several published in the New England Palladium under the signature of "Amyntas." He composed for one of his college clubs, a song, to the tune of heathen mythology; in which he introduced the most prominent characters of his class. He delivered a poem on Genius while in his junior year, in which, describing a modern poet, he says:

"In garret perched, secure from Catchpole's ken,
Our modern poet wields his cumbrous pen;
Led by the gleam his Grub-street poem gives,
He vainly gropes to find where genius lives,
Till famine-worn, at length some prison greets,
And bids him welcome to the Muses seats," &c.

The next poem he delivered, was on the death of Washington,—previous to which had been published one on Washington called from his retirement to take command of the army—from which we make the following extract:

"From power withdrawn, again behold him rise,
Not Cæsar-like, amid his country's cries—
Not Cromwell canting with insidious guile,
Nor Egypts conquerer on a soldier's smile,
But like the Sun, refreshed from sweet repose,
His country's light with cloudless splendor rose,
To drink each dew-drop from her grief-worn eyes

> And mark by his, her journey to the skies—
> And like the sun-flower all his power obey,
> All turn to him, their genial source of day."

Another on "Energy of Character" was much admired. As soon as he became of age, all the energies of his mind were concentrated upon the worshipped idol of his boyhood—painting. Wishing to perfect himself in this noble art, he employed his share of the paternal estate in defraying his expenses to foreign lands. Italy, the cradle of art, had long been the goal of his aspiration—and after revelling for a time in its classic shades, and gathering new impulse from a contemplation of the finest works of her immortal sons, he departed for England. Here his genius burst forth with renewed fire and was duly appreciated. We might, from the memoir of his eventful life which has been kindly furnished us—enter into minute details of his career at this period—but the limits of a Magazine will not allow it. The delightful task must be reserved for an abler pen.

In the year 1801 Allston arrived in England; there he became a pupil of the Royal Academy then under the control of our gifted countryman, WEST, who at once perceived and duly appreciated the talents of the young aspirant for fame—yet, while pursuing the arts with all the ardent enthusiasm of his soul—the intellectual was not abandoned. The poet Coleridge became his friend, and he observes in one of his letters, "To no other man do I owe so much, *intellectually*, as to Mr. Coleridge with whom I became acquainted in Rome, and who has honored me with his friendship for more than five and twenty years."

We are obliged to pass over many agreeable reminisences—which we have no doubt would give great pleasure to the many friends of the Artist to record—and speak only of the most important incidents in his brilliant career. Although bowing in adoration at the shrines of genius in foreign lands, his heart turned fondly toward the country of his nativity, and it was his wish that the best and most successful efforts of his pencil should be bestowed upon America—but fortune decided otherwise. He left his native shore with the sum of twenty-five thousand dollars—amply sufficient with proper economy to supply all his wants while absent—but he had so little parsimony in his disposition, and a heart so open to charity and benevolence that his hand was ever open, his purse ever ready to succor the needy and oppressed. His drafts upon his banker in America were duly honored but the money disappeared almost miraculously, until he found himself almost a stranger in a strange land, and without resources. Fortunately two pictures which he painted about that time attracted the attention of amateurs, and one, the Angel Uriel sitting in the Sun, was purchased by the Marquis of Stafford—and the members of the Academy presented the artist with a hundred and fifty pounds as a mark of their approbation for the talent displayed in the picture of Uriel. Another called "Elijah in the Wilderness" was also purchased by the Academy, and there is no doubt that all his works would have been readily disposed off in England, but for a desire of his to enrich his own land with the fruits of his labors. He writes thus in a letter to his brother in the year 1812.

"It is an awkward thing to repeat our own praises even to a brother. I enclose you however, some notices from one or two papers. The success of the Uriel makes me regret that I did not exhibit the Jacob's Dream also, which my friends are inclined to think very much superior to Uriel. But I have reserved that for America, thinking to have embarked before the exhibition would close. They all think it would have been instantly purchased. However, every thing is for the best; and I am more than content. I am now at work on the large picture of Belshazzer's Vision which I purpose finishing in Boston."

The notices in the London Examiner was as follows:

THE ANGEL URIEL.—W. ALLSTON.—This is an Archangel introduced into some pleasing lines from a poetical *vision* called a *Visit to the Sun*, which describes him as the same

> "That once entranced th' immortal Milton saw."

The same which Satan, on his journey from Hell to Earth, addressed on his arrival in the sun, and who saw him as

> "A glorious Angel stand,
> On some great charge employed,
> He seemed, or fixed in cogitation deep."

From these lines in MILTON, and from

the following in the *Vision*, the Painter has given not an unsuccessful poetical portrait of the *Archangel*.

" The gorgeous Form that now upon his throne
Of rocky amber, like some mountain peak
Dark 'gainst a lunar sky, before me rose
In giant majesty."

Now, as this is a subject which mingles the beautiful and the grand with a poetic fervor of feeling, that fixes thought not on the common place or even elegant of what is earthly, upon a nobler species of beings, upon an object unearthly and celestial, even a partial success in painting, it demands much praise for the Artist, and this praise we cordially bestow upon Mr. Allston, whose pictures always have a high and in part at least a successful aim. His is no " vulgar bosom,

" But alive to thoughts of honorable fame."

We can equally with our Artists admire in Mr. Allston's Uriel, that *Form* whose colossal size and pliant and well turned limbs vindicate the powerful " Regent of the Sun," but which power is agreeably tempered by such a complacency of expression, as shows that the celestial being enjoys the bliss and is conscious of " the approving smile of heaven," mixed and enlivened with a look that becomes the activity of ken and movement of him, whom Milton describes as

" One of the seven,
Who in God's presence, nearest to his throne,
Stand ready at command, and are his eyes
That run thro' all the heaven's, or down to the earth
Bear his swift errands."

Not a small part of the beauty of this figure arises from the agreeable balance of vivid light and sober shade, the first displaying the fresh complexion of the Angel, and the fervor of the solar atmosphere ; and the latter, by softening down a degree of that fervor, aiding the placid sentiment of the picture. We here, however, think that there is little discordance from the change of warm fleshy tints in the lights to too grey a tint in the shadows. This picture would make a striking print. It is already engraved on our hearts."

In the year 1824 Washington Allston having returned to his own country, located himself in Boston where he applied himself with renewed energy to both literature and the arts. He had become equally distinguished in both. His poetry is marked by a graceful ease and flow of language which makes it delightful to read. There is none of the heaviness of the old English bards—nor a mere stringing of rhymes with little sense or meaning, which are peculiar to many of our modern aspirants for poetic fame. His " Paint King" the meaning of which it has puzzled so many to inperpret, is one of the most lively and sparkling gems from his prolific pen. " The Poets' Dream" is replete in beauties, and to our unsophisticated taste, never wearies in the perusal—for, like his own sylph of spring,

" His was the warm, awakening hand
That made the grateful heart expand,
And feel the high control
Of him the mighty Power that moves
Amid the waters and the groves,
And through his vast creation proves
His omnipresent soul."

But whole reams of paper would not suffice us to do full justice to the merits and genius of Washington Allston. We understand that a full memoir of his life is about to be published, and we resign to the talented author the sweet and glorious task.

A few more remarks, and we have done. While employed upon his last and unfortunately unfinished production, he thus writes to a brother at Havana.—

" As to myself, I am still fagging at Belshazzar's Court. He is a sad tyrant, and keeps me at work like a slave, but I hope soon to be rid of him, I think he ought to reward me well for the riches I have so profusely bestowed upon him, and his queen mother ; having manufactured at least fifty thousand pounds worth of jewels for them this last week. What generous fellows we painters are ! We throw about our pearls and diamonds as if they cost us nothing—which in truth they do. These visionary riches materially make me think of my own poverty ; and yet I do not repine at it. I am far happier, I am persuaded, as I am, than if I possessed in substance all the jewels ever painted."

We have made this sketch somewhat lengthy, but the subject was one of unusual interest. The distinguished painter and poet died suddenly on the 8th of July 1843.

His was a light that dazzled not—but stole
Serene and pure upon the raptured soul ;
A conqueror's power had he, but not to bind
In galling chains the suffering of mankind,
But warm the heart with an immortal flame,
Which guides and cheers it in each noble aim.
Best to employ the talents God has given,
The world enlighten—and prepare for Heaven.

MR. FOX TALBOT'S PATENTS IN ENGLAND.

As there exists considerable desire to be made acquainted with the nature and full extent of Mr. Talbot's claims to Photographic discoveries for which he has obtained letters patent, we have taken the trouble to procure synopsis of his specifications.

We have already, in our January number, given his latest improvements; and we believe that the following includes all his other claims.

Mr. Talbot's first patent is dated Feb'y. 8th, 1841, and comprises what is generally known as the Calotype; or Talbotype. It is as follows:—

"The first part of the invention is for making paper extremely sensitive to light; and for this purpose the best writing paper is selected and prepared in the following manner:—Paper having a smooth surface and a close and even texture should be chosen, and one side thereof washed, by means of a soft camel's-hair brush, with a solution composed of 100 grains of crystallized nitrate of silver, dissolved in six ounces of distilled water. A mark must be made on that side of the paper that has been washed, in order to know it again; and it should be dried very cautiously at a distant fire, or allowed to dry spontaneously in a dark place. When dry, the paper is immersed in a solution of iodide of potassium for a few minutes;—the solution consists of 500 grains of this salt, dissolved in one pint of distilled water. After this, the paper is taken out and dipped in water, and then dried, by applying blotting paper lightly to it, and afterwards exposing it to the heat of a fire, or allowing it to dry spontaneously."

"It is preferable to do this process in the evening, by candle-light, as there is less intensity of light, and therefore the paper is not so liable to be spoiled. The paper thus prepared, is called iodized paper; and although it is scarcely sensitive to light, yet it should be carefully kept in a portfolio, or some dark place, until required for use. It does not spoil by keeping any length of time, if this is carefully attended to, and it is not exposed to light."

"When the iodized paper is required for use, a sheet is taken from the portfolio, and washed with the following solution:—100 grains of crystallized nitrate of silver, dissolved in two ounces of distilled water, and add to this one-third of its volume of strong acetic acid; then dissolve a small quantity of crystallized gallic acid in distilled water, and mix the two solutions together in equal proportions, and in no greater quantity than is required for immediate use, as it will not keep good long. The patentee calls this mixture 'gallo-nitrate of silver'; and he applies it to the iodized paper by means of a soft camel's-hair brush, on that side which has been previously marked. This operation should also be performed by candle-light; and after allowing the paper to remain half a minute to absorb the gallo-nitrate of silver, it should be dipped in distilled water, and dried lightly, first with blotting paper, and then by means of a fire, holding the paper at a considerable distance therefrom. When dry, the paper is fit for use; and it is advisable to use it within a few hours."

"The paper thus prepared, the patentee calls 'calotype paper,' and it is placed in the camera obscura to receive the image formed in the focus of the lens. While being placed in the camera, and adjusting the same, the paper must be defended from the light by a screen; which, when every thing is properly arranged, may be withdrawn, so as to expose the paper to the light which enters the camera, and thereby receive the image."

"If the object is very light, or the duration of the operation sufficiently long, a sensible image is seen on the paper when removed from the instrument; but if the time is short, or the objects dim, no image whatever is visible, and the paper appears entirely blank. An invisible image is, however, impressed upon the paper, and is made visible in the following manner:—Take some of the gallo-nitrate of silver above mentioned, and, with a soft camel's-hair brush, wash the paper all over with this liquid; then hold it before a gentle fire, and in a short time the image will begin to appear; and those parts upon which the light has acted most strongly become brown or black, while the others remain white. The image continues to grow more

and more distinct for some time; and when it becomes sufficiently so, the operation must be terminated, and the picture fixed; and in order to effect this, the paper must be dipped first into water, then partly dried by blotting paper, and afterwards washed with a solution of bromide of potassium, consisting of 100 grains of the salt, dissolved in eight or ten ounces of water. The picture is then again washed in water, and finally dried as before. In place of bromide of potassium, a strong solution of common salt may be used."

"The lights and shades of the picture thus obtained, will be reversed; that is, the lights of objects will be represented by shades, and the shades or dark parts by lights; but it is easy to obtain a second picture from the first, so as to produce a picture which is conformable to nature; that is to say, with the lights represented by light parts, and the dark places by shades. In order to do this, a second sheet of calotype paper is placed in close contact with the first; and a board being placed beneath them, and a sheet of glass above, the whole is pressed in close contact by means of screws, or in any other convenient manner. Then, by placing them in the sunshine or daylight for a short time, an image or counterpart of the picture, is formed on a second sheet of paper, but with the lights and shades properly arranged. The image is sometimes invisible at first, but it may be made to appear in the manner above stated."

"The patentee does not recommend that the copy should be taken on calotype paper, but on common photographic paper, which is prepared by washing good writing paper, first with a solution of common salt, and then with a solution of nitrate of silver. On whatever paper the copy is taken, it should be fixed in the manner above explained; and after a calotype picture has furnished a good many copies, it sometimes becomes faint, and the latter pictures are inferior. In order, therefore, to revive the strength of the original, it is only necessary to wash them again by candle-light with gallo-nitrate of silver, and then warm them. The shades of the picture are by this means considerably darkened, while the white parts remain unaffected. After this process, the picture requires fixing a second time, and it will then yield a second series of copies; and, if required, a great number may be frequently made. A photographic picture, taken on other kinds of sensitive paper, may be strengthened and revived in the same manner; but they are inferior in beauty, and the result is less to be depended on; the patentee, therefore, does not recommend them."

"The next part of the invention consists in a mode of obtaining positive photographic pictures, in which the lights are represented by lights, and the shade by shades. We have already explained how this is done, by a double process; we shall now proceed to describe the method adopted by the patentee, doing it in one single process:—"

"A sheet of sensitive calotype paper is exposed to the daylight for a few seconds, or until a visible discoloration or browning of its surface takes place; then it is to be dipped into a solution of iodide of potassium, consisting of 500 grains to one pint of water. The visible discoloration is apparently removed by this immersion; such, however, is not really the case, for if the paper were dipped into a solution of gallo-nitrate of silver, it would speedily blacken all over. When the paper is removed from the iodide of potassium, it is washed in water, and then dried with blotting paper. It is then placed in the camera obscura, and after five or ten minutes, it is removed therefrom and washed with gallo-nitrate of silver, and warmed, as before directed. An image of a positive kind is thereby produced, and represents the lights of objects by lights, and the shades by shades, as required."

"Engravings may be copied in the same way, and positive copies of them produced, but reversed from right to left. For this purpose, a sheet of calotype paper is exposed to the day-light to darken it, as before mentioned; but it should be darkened rather more than when intended to be acted upon in the camera. The engraving and the calotype paper must be pressed into contact by screws or otherwise, and placed in the sunshine, and the copy will be produced in a few minutes. If the copy is not sufficiently distinct, it must be strengthened by means of gallo-nitrate of silver, as before described."

"The patentee says, 'he is aware that the use of iodide of potassium has been re-

commended by others, for obtaining positive photographic pictures; he therefore does not claim it when used by itself, but only when employed in conjunction with gallo-nitrate of silver, or when the pictures obtained are rendered visible or strengthened subsequent to the first formation.' "

"In order to obtain portraits from life, the inventor prefers a camera, the focal length of whose lens is not more than three or four times the size of the aperture; and the head of the person whose portrait is to be taken, must be kept as steady as possible; and, upon pointing the camera at it, an image is received on the sensitive calotype paper."

"The inventor prefers carrying on the process in the open air, under a serene sky, and without sunshine; and the image is generally obtained in half a minute. If sunshine be employed, a screen of blue glass should be used to defend the eyes from too much glare. This colored glass does not materially weaken the power of the chemical rays, to affect the paper. The portrait thus obtained on the calotype paper, is a negative one; it must, therefore, be reversed, as above explained."

"The claim of novelty made by the patentee is, first, employing gallic acid, or tincture of galls, in connection with a solution of silver, for the purpose of rendering paper (that has been previously prepared) more sensitive to light; secondly, making photographic images visible on paper, and strengthening and reviving such images (when only imperfectly seen) by operating upon them with liquids, which act upon those parts of the paper which have been previously acted upon by light; thirdly, producing portraits from life upon paper by photographic means; fourthly, the employment of bromide of potassium, or some other soluble bromide, for the purpose of fixing the images."

"The next part of the invention is for a method of obtaining photographic images upon copper. To effect this, the patentee takes a polished copper-plate, and exposes it to the vapor of iodine or bromine, or the two substances combined, or either of them in combination with chlorine. Or the copper-plate may be immersed in a solution made by dissolving one of the above-mentioned substances in alcohol, or some other solvent. By this means, the polished surface of the copper becomes sensitive to light, and a photogenic image may then be obtained in the ordinary manner. When the plate has remained long enough in the camera, it must be exposed to the vapor of sulphuretted hydrogen, or one of the liquid hydrosulphurets. This vapor produces various colors on the plate, according to the intensity with which the light has acted on the different parts; consequently, a colored photogenic picture is obtained. No further process, for fixing the image, is required, as a subsequent exposure to the light does not affect the picture."

"Other vapors or liquid solutions, which color the sulphuret of copper, may be employed instead of the sulphuretted hydrogen; such, for example, as iodine, bromine, or chlorine, may be used, but with less advantage. In reference to this part of the invention, the patentee claims the methods above described, of rendering copper sensitive to light; and also the mode of coloring the photogenic image, and rendering it permanent by subsequent exposure to vapors or liquids, which act with different effects on those which have or have not been exposed to the action of light."

"The next part of the invention is described as follows:—A smooth surface of steel, platinum or other metal, is covered with an extremely thin layer of silver, which is then made sensitive by any of the known methods, and a photogenic image is obtained. The plate, with the image thereon, is then placed in a horizontal position, and a solution made of acetate of lead dissolved in water, is then poured upon it. Then, by passing a galvanic current through the plate and solution, a colored film is precipitated upon the plate. The claim to this branch of the invention, is for the application of colored films, produced by a solution of lead, acted upon by a galvanic current, for the purpose of producing colored, or otherwise diversified photogenic images."

"The next part of the invention consists in producing very thin plates of silver, for the purpose of economy, in photographic processes; and also for greater convenience when traveling. In order to effect this, a thin layer of copper is precipitated by the electrotype process, on to a polished metal plate; a sheet of paper or

card is then glued or cemented to the back of the copper, and when dry, the paper is removed, with the layer of copper adhering to it; the copper is then silvered by immersing it in a solution of silver."

"The last part of the invention consists in transferring photogenic images from paper to metal. For this purpose, the metal surface is made sensitive to light, and the paper photograph is placed on it, with a sheet of glass in front, and the whole is pressed by screws in firm contact, and exposed to the sunshine. A photograph on metal is thereby produced, and is afterwards fixed or otherwise treated, according to the effect required."

"The method of transferring the image on one sort of the sensitive paper to another sort of paper, has been already described; and the patentee claims the transferring photogenic pictures, obtained on sensitive paper, the metal surfaces, or to a different sort of sensitive paper; and in conclusion he says, 'I do not confine myself to the precise weights and measures of the substances employed in these processes, as they may be varied, according to circumstances; but I have mentioned those which I have found to be, on the whole, most convenient.'"

Mr. Talbot's second patent is dated June 1st., 1843, and consists of various modificacations and improvements on the first.

"The first part of these improvements consists in removing the yellowish tint of pictures taken on calotype and other photographic paper, which has been prepared with a solution of nitrate of silver, by plunging the picture into a hot bath, composed of hyposulphite of soda, (or any other soluble hyposulphite,) dissolved in ten times its weight of water, and heated to nearly the boiling point, the picture should remain in the bath about ten minutes, and be then washed in warm water, and dried. By this means, the picture is rendered more permanent and transparent, and its lights become whiter. After undergoing the above operation, the transparency of calotype pictures may be increased, by causing melted wax to penetrate into the pores of the paper. Under this improvement, the patentee claims the employment of hot or boiling solutions of the hyposulphites, in order to give increased whiteness to calotype and other photographic pictures, and at the same time make them more permanent; also the process of waxing a calotype picture; but only in case the said picture has been previously whitened, or rendered more transparent, by plunging it in a hyposulphite solution, or otherwise."

"The second improvement consists in placing a warm plate of iron behind the paper-holder, during the process of taking a calotype picture with the camera, to communicate warmth to the prepared paper, and thus render it more sensitive. Claim: The process of warming the paper during the formation of the picture."

"The third improvement consists in preparing what the patentee terms io-gallic paper, by washing a sheet of iodized paper with a saturated solution of gallic acid in water, and then drying it. This paper will keep good for a considerable time, if placed in a portfolio or press; and when wanted for use, it may be rendered sensitive to light, by means of a solution of nitrate of silver. Claim:—The preparation and use of the io-gallic paper, as above described."

"The fourth improvement consists in washing iodized paper with a mixture of twenty-six parts of gallic acid, and one part, or thereabouts, of nitrate of silver, (the solutions being of the strength usually employed in the calotype process); it can then be dried before a gentle fire, without being spoiled. It is not quite so sensitive to light as the ordinary calotype paper, but it can be used in a dry state, whereas the calotype paper must generally be used in a moist state, as there is some difficulty in making it quite dry, without more or less injuring it. Claim:—The employment of iodized paper, excited or rendered sensitive by a liquid, containing only a small portion of nitrate of silver, and subsequently dried, so as to retain its sensitive state."

"The fifth part of the invention relates to a method of improving the appearance of photographic pictures. A copy or reversed impression of a photographic picture is taken in the ordinary manner, except that it remains in the light twice the usual time; its shadows are thus rendered too black, and its lights not sufficiently white. It is then washed and plunged into a bath of iodide of potassium (of the strength of five hundred grains to each pint of water) for

one or two minutes, which makes the picture brighter, and its lights assume a pale yellow tint. After this it is washed, and immersed in a hot bath of hyposulphite of soda, until the pale yellow tint is removed, and the lights remain quite white. The pictures, thus finished, have a pleasing and peculiar effect of light and shade, which is not easily attainable by other means. Claim:—Producing a change, by means of iodide of potassium, in the relative intensity of the lights and shades of a photographic copy, subsequently to its first formation, and giving permanence, by a fixing process, to the picture so changed."

"The sixth improvement consists in waxing photographic pictures, to render them more transparent, and then placing a sheet of white or colored paper behind them."

"The seventh improvement consists in obtaining enlarged copies of Daguerreotype and calotype portraits, and other small photographic pictures, by throwing a magnified image thereof, by means of lenses, on a sheet of calotype paper, thus producing a magnified negative copy, from which positive copies can be obtained, in the usual manner. Claim:—Obtaining enlarged portraits and pictures by a double photographic process, as above described."

"The eighth improvement relates to photographic printing. A few pages of letter-press are printed on one side only of a sheet of paper, which is waxed, if thought necessary, and the letters are cut out, and sorted; then, in order to compose a new page, a sheet of white paper is ruled with straight lines, and the words are formed by cementing the separate letters in their proper order along the lines. The page being completed, a negative photographic copy is taken from it, having white letters on a black ground; this is fixed, and the required number of positive copies is then obtained. Another method, is to employ larger letters, painted on rectangular pieces of wood, colored white, and forming pages therewith, by arranging them in rows, on a tablet or board, suitably grooved for that purpose; a copy (of the size desired) is then taken, on sensitive paper, by a camera obscura. Claim:—The application of photography to printing, by arranging suitable letters or figures, so as to form pages, and making photographic images thereof."

"The last part of the invention relates to what the patentee terms photographic publication; that is, producing a number of positive photographic copies of a picture or print, for the purposes of sale. The objects most suitable for such publication are prints, engravings, drawings, letter-press, maps, music, and similar productions. Copying paper is first prepared, by taking good writing paper, without water-mark, and dipping it in a salt-water bath, consisting of three or four ounces of salt to each gallon of water; it is then wiped and dried. After this, it is washed in a solution, formed by mixing one hundred grains of nitrate of silver with two ounces of distilled water, then adding a sufficient quantity of ammonia to form a precipitate, and re-dissolving the same, leaving the solution clear. When dry, the paper may be used for obtaining a negative copy of any print or picture, by placing it in contact therewith, in a copying frame, (consisting, essentially, of a piece of glass, with a board at the back, and tightening screws, as described in the specification of Mr. Talbot's patent of February, 1841,) and exposing it to the light, until the negative copy is produced. The negative copy is fixed by a hot solution of hyposulphite of soda, as before described, and may also be waxed; the requisite number of positive copies are then obtained from it, and are fixed in the manner above mentioned. Claim:—The system or combination of these several processes into one, whereby a new and useful result or branch of manufacture is produced: namely, the multiplication of very permanent and perfect copies of the positive kind; and which system consists essentially of four parts, viz., Firstly,—the formation of the negative copy; Secondly,—fixing it, so that it shall have the requisite transparency, and be free from irregular opaque specks in the interior of the paper, and also that it may endure, without change, great subsequent exposure to the light; Thirdly,—the formation of the positive from the negative copy; and Lastly,—its permanent fixation."

ELECTROTYPE MAN PULATIONS.

BY CHARLES V. WALKER,
Honorary Secretary to the London Electrical Society.

PART I.

PREFACE.

Not one of all the branches of Experimental Philosophy has been more cultivated than Electrotype. Like all, it is replete with interest, whether examined in its theory or in its results,—unlike some, it leaves a trace of its footsteps,—a tangible evidence of its power. I allude not to its profitable applications in the hands of the artisan; furnishing, as they do, a full and forcible reply to the oft-proposed question, "What is the *use* of Electricity?" For him these pages are not written;—his demands upon the art are of another nature, and are intimately connected with his own resources. I write for him who delights to devote a portion of his hours of relaxation to the study of those mysteries of nature, into which the eye of science has been able in a degree to penetrate. It may be safely said, that in the length and breadth of England, the proportion of such individuals is far greater than elsewhere; there is amongst us a national love of *home*, and of *home* occupations; and when we do wander, we feel that we *are* wanderers; and can regard with pleasing anticipation the time which will return us to our *home*. Amongst home attractions is ever found a taste for the fine arts; this is seen even in the cottage, whose walls are adorned with "much that taste, untaught and unrestrained, surveys delighted;" the inmate of the humble tenement, "around whose walls are heroes, lovers, kings," surveys them with a satisfaction closely akin to that which animates the man of cultivated taste, as he views the perfect productions of a Raphael or a Correggio. This taste is abundantly gratified by the discovery of Electrotype; it enables each, who desires it, to furnish himself with durable copies of the finest productions of the chisel and the graver. He finds an exhaustless field open before him; and if he devote his time to forming collections, he is animated at every step by the novelty and interest attached to each fresh acquisition. And not the least feature of interest allied to a collection thus formed, is the fact that each specimen is stamped with a double signature of "mine,"—"mine" it is by *possession*—but especially it is "mine" by *production*,—they are all the work of "my hands."

When I consider how many copies of this treatise have, during the last few months, been dispersed through all quarters of our land, (and not *ours* only,) I cannot but feel that it has been in some measure instrumental in enabling very many to tread the same pleasing path that I have trodden. I trust my endeavors to pave the way have not been unsuccessful. On first venturing along the new-discovered road, I found many a stumbling-stone besetting my steps; and many a time have I had to survey before I could tell which track would lead to the desired end. These obstacles I have endeavored to remove from the path of those who are interested in following the traces marked out; I have, too, watched with care the progress made by others; and have in each successive edition embodied as much fresh information as conveniently I could. To my more mature experience on the subject of mould-making; to the general principles on which the reduction of metals is based; and to the description of new arrangements of apparatus which, with revisions of many paragraphs, were given in the recent editions, I have, in this TWELFTH, added all the improvements up to the present time, that I could conveniently compress in these pages.

It was at first my intention to have added observations on the deposition of other metals; this, however, was not found possible; there was so much to be said that could not be contained within the present pages, that I rather determined to unfold fully the principles and practice of the art in this treatise, and to prepare a SECOND PART, to be devoted to plating, gilding, etching, and all the several applications of

the art, which, for want of space, could not be introduced here. In Part II. will also be found the etching of Daguerreotype plates, and several modifications in Voltaic apparatus. In the fourth edition of Part II. Electro-Printing is introduced; and the processes of plating and etching are dwelt upon more fully.

CHARLES V. WALKER.

Kennington, June 30, 1843.

INTRODUCTORY OBSERVATIONS.

1. The object of the present treatise is not so much to dwell upon the philosophical principles on which the art of electrotype is based, as it is to trace in a familiar manner the several process in manipulation, and the precautions to be observed in order to escape failure. The instructions given are the results of a long course of experiment; and it will be the especial aim of the writer to dwell minutely upon those *little* points which so materially influence the success of the experiments. It will be the endeavor to avoid, as much as may be, the use of scientific phraseology; so that the amateur, for whose use this work is written may find as few obstructions as possible besetting his path. In the course of forming a large collection of medals by the Electrotype process, the author has, of necessity, been led to adopt such modes as convenience and economy dictated. These will be described in order, as the reader is led from the original medal to the perfect copy, ready for the cabinet.

2. Galvano-plastic, Electrotype, or Electro-metallurgy, is, as its several names indicate, intimately connected with Galvanic, or rather, Voltaic Electricity. In order, therefore, to convey correct notions on the subject, it will be requisite, before entering on it further, to give a brief outline of the principles of this science; and to trace their application to the art in question.

3. VOLTAIC ELECTRICITY.—Galvanism or Voltaism is the name given to that development of electricity discovered in the year 1790, by Professor Galvani, of Bologna, and subsequently more fully investigated by the labors of Volta, whose letter to Sir Joseph Banks, the then President of the Royal Society, announcing the discovery of the apparatus, named after him the Voltaic pile, is dated March 20th, 1800. It is obtained by certain arrangements of metals and liquids, of which the following may be taken as an illustration. If a piece of zinc and another of copper be attached one to each end of a wire, and the two be then placed in a vessel containing water, acidulated with sulphuric acid, it will constitute a simple *or single voltaic pair* IN ACTION.

4. The action is caused by the different chemical affinity of the liquid for the respective metals; it will dissolve the zinc—it will not dissolve the copper; in other words, the water, (which is well known to consist of the two gases, oxygen and hydrogen, chemically combined,) is decomposed;—the *hydrogen* makes its escape at the surface of the *copper* plate in the form of gas; the oxygen *combines* with the zinc, and forms an *oxide of zinc;* this oxide unites with, and is dissolved in the sulphuric acid, forming *sulphate of zinc.* Actions analogous to this, occur in *all* voltaic combinations. The exciting liquid has a *greater* affinity for one metal than for the other. The former is termed the *positive* metal; the latter the *negative.*

5. For all practical purposes, zinc is used as the positive metal,—either pure zinc, the zinc of commerce, or amalgamated zinc. (§ 41.) For the negative metal, copper is generally used; but a very convenient arrangement has been devised by Mr. Alfred Smee, (§ 58.) wherein platinized silver,—silver covered with minute particles of platinum,—is employed. Another battery has been constructed by Professor Grove, of a very powerful nature, wherein plates of platinum are used. There is also a battery consisting of zinc and charcoal. Charcoal, or carbon, being the only other substance in nature,—not metallic,—which can be so employed. (§ 32.)

6. I have here spoken (§ 4.) only of the *chemical* change which takes place; but in connexion with this, and bearing a strict relation to it, is another phenomenon of the highest interest,—namely, the disturbance of electric equilibrium.

7. During the continuance of the chemical changes already described, (§ 4.) a transfer of electricity is quietly taking place between the two metals. The positive electricity (which to avoid circumlocution we will assume to be, as possibly it is, *the* electricity,) passes *from the zinc through*

the liquid to the copper, and then continues its course along the wire, (§ 3.) which joins the metals, to the zinc again. If the wire is broken, the transfer of electricity is interrupted, and the chemical effects, so far as electricity is concerned,* cease; hydrogen is no longer evolved from the copper plate, and the zinc (if it is pure or amalgamated,) ceases to be dissolved.

8. The fundamental principle, which cannot be too strongly enforced, is, that the passage of the electricity *in the liquid* is *from* the zinc to the copper. If this simple fact is borne in mind, it will decide in every case the question which confuses so many (§ 165)—namely,—which is the positive, and which is the negative end of a battery? The positive is the end where the electricity *leaves* a battery: the negative where it *re-enters* it. The direction taken by the current being ascertained by the mere inspection of the situations of the two metals *in* a cell, the other points follow as a necessary consequence.

9. If, for instance, the wire connecting the two plates, (§ 3.) by which we have illustrated a single voltaic pair, were broken, and the circuit completed by interposing some apparatus between the broken ends, an examination of the arrangement would at once show, that as the electricity passes *from* the zinc *to* the copper, it would leave the battery by the wire attached to the *copper* plate, and having passed through the interposed apparatus, would return to the battery by the wire attached to the *zinc* plate; the copper, which is the *negative* metal, forming the *positive* end of the battery; and the zinc, the *positive* metal, forming the *negative* end.

10. Electrolysis.—The *great* effects of voltaic electricity, those which have rendered it so attractive a science, are produced by the various modes of combining a large or small number of these pairs of metals, and on the nature of the apparatus interposed between the wires connected with the respective ends of the arrangement. The power, which from its affects, Dr. Faraday has termed the Electrolytic† power, is that which alone demands *our* attention, because on the right understanding of this depends the successful application of the art of Electrotype.

11. If a series of about ten of these voltaic pairs or batteries be arranged in the order of zinc, liquid, copper, and the terminating wires, which for this purpose should be of platinum, be placed in a vessel of water containing sulphuric acid* the water will be electrolyzed or decomposed by electricity; the hydrogen gas will be released at the wire connected with the negative end of the battery, and the oxygen at that connected with the positive. If these gases be collected separately in tubes placed over the platinum wires, the quantity of hydrogen will be double that of the oxygen.

12. If into this acid liquid some crystals of sulphate of copper be thrown, and the current be sent through, electrolysis will still take place,—the water will still be decomposed, but only *one* of the gases, the *oxygen*, will be obtained. The hydrogen, as it becomes released from the water will take the place of the copper in the solution, and the *copper* will be liberated and become visible on the negative (§ 9.) wire. This experiment may be continued till all the copper is abstracted from the solution; the remaining liquid will be water, strongly acid.

13. A third modification of this experiment is by using for the positive wire, one of *copper*, instead of *platinum*. In this instance too, the water is decomposed; but *neither* of the gases is visible. The hydrogen, as before, occupies the place of the copper in the solution, releasing the copper as in the last experiment; (§ 12.) the oxygen, instead of appearing at the positive wire, combines with the copper, of which it is composed, forming an oxide of copper: this oxide unites with the sulphuric acid, and forms a sulphate of oxide of copper. In proportion as the solution is weakened by the release of copper at the *negative* wire, it is thus supplied with copper from the *positive*.

14. It will be observed in these illustra-

* The *ordinary* chemical effects of the acid on the zinc continue, unless prevented by other means. (§ 40, 41.)

† Vide Exp. Researches. Series 7, § 664.

* In this and all other similar instances the use of sulphuric acid is to increase the conducting power of the liquid; to facilitate the passage of electricity through it; the modus operandi cannot be entered into here.

tions of electrolysis, that the metals are released at the *negative* plate. One part of the science of Electrotype,—a science discovered in England by Mr. Spencer, and on the continent by Professor Jacobi, consists in preparing for a negative plate models or moulds (§24. 28) of objects to be copied ; and in so arranging the battery or apparatus, which generates the voltaic current, (§63. 64.) as to release the metals in a compact and solid form.

15. On these two points many precautions are to be observed; but a faithful compliance with the directions to be given, will enable the least skilled to obtain metallic copies of the most beautiful works of art, by merely exercising ordinary care and a little patience.

16. Constant Voltaic Battery.—Before closing these prelimininary observations, it will be requisite to give a brief descriptions of the Constant Battery. The voltaic pair, immersed in a cell of acid water (§3.) is liable to *three* objections. First: The bubbles of hydrogen released on the copper plate, of necessity, prevent portions of this plate from being in actual contact with the liquid ; and hence its power is less than it might be. Second: The dissolved zinc is partially released and deposited on the copper, or negative plate, according to the laws already illustrated: (§ 14.) hence arise counter-currents, which weaken the force. Third: The acid very speedily becomes saturated with oxide of zinc, and *all* action ceases.

17. Professor Daniell has, by the invention of his constant battery, enabled us to overcome in a very great measure all these difficulties,—to remove all these objections. The deposition of the zinc is obviated by using two liquids, separated by a porous partition, or, as it is called, a diaphragm, of animal membrane, paper, (§ 37.) earthenware, plaster of Paris, wood,* &c. (§ 44.) The liquid contiguous to the zinc is, as before, (§ 3.) acidulated water; that near the copper is a solution of sulphate of copper.† By this arrangement, it will be seen, from what has been already stated (§ 12, 13.) that *copper* will be released, in place of *hydrogen* on the copper,—the negative plate.

18. The deposition of copper on the negative plate prevents the deposition of zinc, even when the sulphate finds its way through the diaphragm: for according to certain laws, into which it will be foreign to the present purpose to enter, the metals are released from solutions in regular order. The fact, however, may be easily determined by using a *brass* plate, in any of the arrangements to be hereafter described; (§ 48, 51.) and it will be found to produce a *copper* medal. The zinc which forms a constitutent part of the brass, remains in the solution.

19. The *continuous* action of this battery is preserved by *amalgamating* (§41.) the zinc, and supplying the cuprous solution with crystals of sulphate of copper. (§ 46.) The former prevents the acid acting *chemically* on the zinc (§7,40.) and destroying it uselessly: the latter keeps up the strength of the solution, which is being constantly exhausted by the reduction of the copper.

This instrument is termed a *constant* battery, from its power of continuing a generally steady action for a lengthened period of time. It has been constructed in various ways, being modified according to the taste of individuals, or to the use to which it is to be applied. But whatever *form* may be given to it, it is still the constant battery, invented by Professor Daniell, to whom alone the credit is due for devising so valuable an arrangement. The cell, being of copper, itself forms the negative metal. A rod of amalgamated (§ 41.) zinc is placed, within a tube of porous earthenware. Attached to each metal is a binding screw, to form connexions. A cell of this description is put into action by placing the porous cell within the copper cup and the amalgamated zinc in the centre of the porous cell, a rod passing through the upper part of the zinc rod to support it on the sides of the cell. Filling the porous tube containing the zinc with a mixture of one part sulphuric acid, and ten parts water; and filling the copper cell with a saturated solution of sulphate of copper.—By *saturated* is meant a solution containing as much of the salt of copper as the water will take up.—This is prepared most readily by pouring boiling water on a su-

* Lime-tree or some other porous wood, boiled for an hour at least, in water containing a little sulphuric acid—*Jacobi.*

† This is more properly termed sulphate of *oxide of copper.*

perabundance of crystals of sulphate, and stirring them; to this solution one-tenth acid should be added. The perforated metal shelf shown, is to support a supply of crystals to recruit the exhausted strength of the battery. (§ 46.) The crystals are placed thus *high up* in the liquid, because the upper portions are exhausted *first;* the specific gravity keeps the stronger parts of the solution below.

Note on Voltaic Batteries.—While on the subject of voltaic pairs it would be as well to pen a few lines on those powers of the battery, not directly connected with the art of Electrotype. If a cell of the constant battery be charged as directed, (§19.) and a piece of fine platinum wire be stretched from the screw attached to the zinc, to that attached to the copper, it will attain a red or a white heat. This is termed the "heating power" of a battery. The larger the cell, the greater thickness of wire will be heated. If *too thin* a wire be used, the passage of the electricity will be so much retarded as to produce no visible indications of heat. The *length* of wire that can be heated depends on the cooling power of contiguous *air;* "a current that will heat one inch of platinum, will heat a hundred inches."* The law which regulates the comparative length of wires heated by different combinations of the batteries is this: If one such cell as that described, heats x inches, and another cell y inches, the two arranged in series will heat $x \bowtie y$ inches.†

If a series of cells be arranged by uniting the copper of one to the zinc of the other, and points of charcoal be attached to the terminating wires, upon bringing these points into contact and then separating them, the well-known phenomenon of the voltaic flame is produced. The *length* of this flame depends on the number of cells used; the size or *thickness*, (if we may use the term) on the size of the cells. The flame from a hundred cells is very brilliant; in some experiments made with a series of upwards of three hundred, it was needful to screen the eyes with a black silk veil. Few things resist the intense heat of this flame; the metals are speedily dissipated in fumes; platinum and gold are melted and vaporized. The arrangement of cells in series will produce a shock on the human frame, intense in proportion to the *number* in the series. Thirty will produce the effect: three hundred will produce more than a man with ordinary nerves could endure. The power of batteries to decompose solutions has been already described; (§ 11, &c.) on a right application of this power depends the success of electrotype experiments. A solution very easy of decomposition is one of iodide of potassium. A battery consisting of a wire of zinc and one of copper, will decompose this solution contained in a piece of blotting or bibulous paper. Water is more difficult of decomposition. Ten cells of a Daniell's battery are a convenient number to effect the decomposition of this. A series of twenty will release very little more gas than one of ten but *two* series of ten placed *side by side* will do twice the work of *one* series. By an arrangement of this kind it is that the maximum of decomposing power is obtained from a given number of cells. And by regulating the number and nature of the batteries, according to the nature of the solution acted on, the electrician is enabled to retain a command over the most refractory bodies. From this it is manifest that no direct reply can be given to the inquiry, Which is the best form of battery? The nature and form must depend on the objects for which it is intended. One species of battery produces effects closely analogous to those obtained by the common electric machine. This is termed a water-battery. One or two thousand cells containing pairs of plates (copper and zinc) are connected in series, and charged with water. There is a beautiful regularity in the action of batteries, that cannot fail to interest the most casual observer; it is a regularity to which the attention of the electrotypist should be especially directed. When a number of cells are connected in series according to the plan already described, precisely the same amount of action occurs in each. If in one an ounce of zinc is consumed, so also is it in every other; and in each too, a weight of copper is deposited on the surface, equivalent to the ounce of zinc. And, if the terminating wires of this apparatus be placed to produce the decomposition of a solution precisely the same amount of this will be

* Faraday's Researches. Thirteenth Series, § 1631.

† Transactions Electrical Society, p. 63. § 36.

decomposed, as is equivalent to the quantity of zinc consumed or copper released in each cell. If water be the subject of experiment, the same arrangement of battery will release more or less gas, according to the degree of conductibility given to the water by means of sulphuric acid; the less conductible it is, the greater resistance it offers to the passage of the battery current, the less gas is released, and the less zinc is consumed: as the conductibility increases, the rate of decomposition is higher, and the energy of the action in each battery cell is greater. There is a harmony in all this consistent with what we have hitherto learned of the laws of nature. The knowledge of this law is no small addition to the science of electricity: and it must not be forgotten, that the development of this beautiful system of things is due to an *English* philosopher, whose perseverance in research, has been crowned with continued success. Without dilating longer on these general features of the science, I shall pursue the object at present in view, and endeavour, with as much brevity as is consistent, to explain the nature of the Electrotype art, with so much of its theory, as joined with what has been already said, may guide the experimenter safely through each process.

PREPARATION OF MOULDS.

20. I can very reasonably conclude that the amateur will commence his experiments on the smaller works of art; and, as a knowledge of the mode of manipulation to copy these, will, with a little practical experience, easily pave the way towards accomplishing greater things, I shall dwell principally on the art of copying medals, medallions, seals, &c., taking the reader with me, through the entire process.

21. There are many materials fitted for forming moulds; of these—*fusible metal*, *wax*, *stearine*, and a composition whose base is *spermaceti*, are mostly used. The first is applicable to all medals of ordinary size,—the others to plaster medallions and larger medals.

22. Fusible Metal.—This is an alloy, consisting of bismuth, tin, and lead; it melts at a low temperature,—a few degrees beneath that of boiling water: and has been used as a philosophical toy, in the form of spoons, which melt in hot tea. For this purpose it generally contains a small portion of mercury. Since the discovery of Electrotype, it has been prepared for that purpose, without mercury.

23. The proportion of the different ingredients in a pound of this alloy is:—

	oz.
Bismuth	8
Tin	3
Lead	5
	16=1 *lb.*

These should be melted together in a *clean* iron ladle, taking care to keep it on the fire no longer than is necessary to produce the complete liquefaction of the several ingredients. When melted, pour the metal on a stone or marble slab in drops. Then, after having *rubbed the ladle clean* with coarse paper, return the pieces of metal, remelt them, and pour them out in drops as before. A third melting will ensure the ingredients being well mixed. To retain the metal in a fit condition for use, the ladle must be frequently rubbed clean; and must always be removed from the fire *as soon* as its contents are melted. The former ensures a bright surface to the mould; the latter preserves the alloy from waste by oxidation.

24. *To make a mould in fusible metal.*—Melt some in the iron ladle, and pour it on a slab; then, from the height of two or three inches, drop on it the medal to be copied, taking care that the medal is cold. In a few *seconds* the metal will be solid, and may be placed to cool; when it is cold, either with or without a few slight taps, the two will separate; and if proper care has been taken, an *exceedingly sharp* mould will be obtained. The novice must not, however, be disheartened if his first attempts to obtain good moulds fail: for there are so many little accidents which may happen, that the most practised manipulator may have to repeat his attempts. A slight shake of the hand may drop the medal irregularly;—too much sunk, for instance, on one side. A film of oxide may rest on a portion of the surface of the melted metal, and render a portion of the cast *dull.* Dull looking moulds must always be rejected, for so minutely correct is the process of Electrotype, that the dulness of the mould will be transferred to *every* copy made from it. Even if an original medal

be incautiously handled, the slight trace of a finger-mark will be transferred to the mould; and thence to the Electrotype copies.

25. The fusible metal will not always pour into a *round* mass, to receive the medal; unless the slab is perfectly level, it runs into a stream. This is a great inconvenience, but may be remedied by having a shallow cavity (saucer fashion) made in the marble; or by using any article of *earthenware*, which the kitchen or the laboratory may furnish, suited to the purpose. I have been in the habit of using the brown stone-ware saucers, in which blacking is sold; and in them have produced some of the best moulds. They are to be inverted, and the metal is to be poured on them. The impressions obtained from *warm* medals are far less likely to be sharp, than those obtained from *cold*.*

26. Having obtained a mould, varnish the back and edge,—and also a portion of the front, when the surface of the mould around the impression is larger than necessary. The best varnish is good sealing-wax dissolved in spirit of wine.

27. It will now be ready for use, and is to be attached to a copper wire. The end of the wire must be *quite clean;* the wire is placed across the flame of the candle, with the clean end beyond the flame; it is to be touched with a piece of rosin, and pressed on the edge of the mould. The mould will instantly melt to receive it, and in a few seconds it will be cold and firmly fixed. The moulds should be wrapped in paper, if they are not intended for immediate use.

28. Wax Moulds.—The manipulation with this material is very simple. The wax employed is the common white wax, or the ends of wax candles. It is to be melted in an earthen pipkin or a small jug, and kept by the fire-side a few minutes after it is well melted. The medal to be copied should be made warm,—the warmer the better; (the object being to prevent the sudden chill of the wax when poured on.) It is to be surrounded with a rim, composed of a ribbon of paste-board. The end of this may conveniently be secured by a small *cleft stick.* The surface of the medal should be *very* slightly covered with olive oil. The hot wax is then poured on. It may require five or six hours to become sufficiently cold for removal; and great care must be taken to allow the cooling process to be gradual; for, without this precaution, the moulds, especially when of larger objects, are apt to split. There will be at times a difficulty in removing wax moulds from medals with elaborate work This may be obviated by a little care: the medal should be very slightly warmed by the heat of a candle, so as to cause a trifling expansion of the metal; and the wax is then to be drawn cautiously, and at right angles, from the surface of the medal. This applies to other composition moulds.

29. Stearine Moulds, &c.—From a few practical inconveniences attendant on the use of wax, I have at times preferred *stearine*, and consider it on the whole more useful, especially in copying works in metal; but recent experience has taught me that a still better material, is a composition consisting of 8 oz. of spermaceti to 1 3–4oz. each of wax and mutton suet. While preparing the Tenth Edition for the press, the Rev. F. Lockey wrote me word that next to the Clichee moulds, he found nothing produce better than a mixture of wax, stearine, and *black-lead.* On this hint, I have added black-lead to some of my compositions, and with advantage. Since writing this paragraph I have examined some moulds made with wax and a little of what is termed *Flake-white*, and never saw any to equal them,—nay, not even the metal moulds.

30. That such compositions will produce minutely correct copies of plaster casts renders them invaluable to the electrotypist, who employs his scientific resources towards the formation of a collection of works of art. For he is thus enabled to transfer impressions from the frail and perishable *plaster* to the durable *copper;* and to transfer them with all their beauty and all their perfection. Those who have obtained

† The best and *sharpest* moulds are to be obtained by pouring the fusible metal on a sheet of brown paper, and stirring it well together with two cards, until it is about to crystallize:—the medal is to be held in the hand, or in a wooden block prepared for it, and firmly pressed on the metal till it solidifies. This will happen instantly, if the operation is well managed. These moulds are what the French call *Clichees.* (For the composition of Clichee metal, and its management, vide Part 2, § 102—4.)

but a casual insight into the treasures transferred to this delicate, but brittle material, have seen enough to assure them that there is an ample store to suit every taste and every temper. For a few pence, specimens of first-rate execution may be obtained from any of the plaster shops in London;—they are often to be met with in the hands of the Italian boys, who frequent the streets. Care should be taken that the specimens selected are free from defect. A few weeks' experience among medals will be of more avail, in guiding the judgment, than pages of written instructions.

31. To copy Plaster Casts. — Pour some *boiling water* into a plate; stand the cast *face upwards* in this water; the water must not be deep enough to reach the *face* of the cast. In a few minutes, the cast will be filled with water.* Then, without loss of time, wrap round it a ribbon of pasteboard as before, (§ 28.) and *immediately* pour in the melted composition. After it becomes solid, let it remain for two or three hours, and the mould may *generally* be lifted off from the plaster, without further trouble.†

32. *To render wax or composition moulds conductible.*—They, whose knowledge of electricity is the most elementary, are aware that wax is a non-conductor; and as such will not be of any service to convey the voltaic current. In order to render its surface conducteous, many plans have been devised. There is one which combines the three advantages of simplicity, certainty, and economy: and this alone will be described. It is to cover the surface with black-lead; the application of this substance was recommended by Mr. Murray; it was also employed by Prof. Jacobi, and its management is described in his "Galvano-plastic."

33. This article is known in commerce under the several names of plumbago, graphite, and black-lead. The latter might naturally enough induce those unacquainted with the subject, to conclude that *lead* held a prominent place in its composition. This, however, is not the case; it contains no lead at all; it consists of carbon and iron;* the principal portion being *carbon*. This substance has been already mentioned; (§ 5.) it is a very good conductor. Plumbago is largely used in the arts: the finer sorts for drawing-pencils, the inferior in domestic economy, for polishing iron-work. It does not seem that the difference of quality in this substance depends entirely upon the quantity of carbon it contains. The common qualities, such as are used for polishing stoves, are very good conductors; and, if tolerably *pure*, will answer our purpose as well as the best among the finer specimens. Unfortunately, however, the common kinds of black-lead are largely adulterated: among the substances used for adulteration, are plaster of Paris and charcoal. To obtain this article sufficiently pure for Electrotype purposes, through the ordinary channels, is a matter of some doubt. The demand, however, has caused a supply through a new channel. The instrument makers, who sell the apparatus for Electrotype experiments, generally keep plumbago in a fit condition for applying to wax moulds.

34. It must be applied dry. Having breathed slightly on the mould, dip a soft brush into the plumbago, and rub it briskly over the surface; continue this, breathing on it occasionally, till the whole presents the well known black-lead polish. Be very careful to rub the brush into every spot. The best kind of brush is a strong and fine camel's hair pencil. With care this operation will not affect the sharpness of the mould in the slightest perceptible degree. When the mould seems to be covered, if upon breathing on it, any parts appear *whitish*, repeat the operation. A clean wire slightly warmed, and pressed against the back of the mould, will become firmly imbedded in it. Then rub the wire and the wax about it with the plumbago brush, in order to complete the connexion between the two. It is advisable to remove any plumbago which may have been spread on the edges of the mould, by scraping them with a knife. The mould is then ready for use, *small;* but if *large*, add the guiding wires described. (§ 61.)—In like manner sealing-wax impressions may be coated. To cause the plumbago to ad-

* The *small* delicate casts, which are slightly *tinted*, are best copied by first moistening their surfaces with olive oil, and then pouring on the wax.

† Vide (§ 79,) for the removal of any plaster which may adhere.

* Its chemical name is carburet of iron

here, moisten the seal *slightly* with spirit of wine, or expose it to the vapor of ether.*

35. *Plaster of Paris Moulds*.—Another mode of making moulds is with fine plaster. They are to be saturated with wax or tallow, by standing them in a shallow vessel, containing these substances in a melted state ; and when cold to be coated with plumbago. (§ 34.) The best fine plaster should always be used : it should be *fresh* ; if kept any time, it must be preserved from the air in jars or otherwise. In mixing, water is first poured into a lipped basin ; the plaster is gradually dropped in, and the supernatant water poured away : the water which remains with the plaster is the proper proportion to be stirred with it ; when well mixed, let a small quantity be brushed into all the work of the medal with a camel's-hair pencil ; this removes air bubbles : then pour on the plaster to the thickness required. If the objects to be copied be lightly oiled first, little difficulty will be experienced in removing the plaster mould when "set."—Fusible moulds will, with proper care (§ 60, 65.) produce successively as many Electrotype copies as the operator pleases. Wax or composition moulds are most commonly damaged, more or less, in removing the deposit.—While on the subject of moulds it may be as well to mention that a plan has been recently recommended of obtaining a solid medal, with *both* sides, by placing two moulds face to face, and allowing the deposition to proceed till the intermediate space is filled up. I should suggest to those who attempt this, to adopt a modification of a method recommended by Professor Jacobi, which cannot but greatly facilitate the process. Instead of suspending the mould *vertically*, when placed in the solution, (§ 48.) let it be *horizontal*. (§ 65.) After the action has deposited a good layer of metal, *sprinkle between the two surfaces, copper filings*, and then allow the action to continue ; the subsequent deposit will so blend with the filings, that they will become part and parcel of one solid mass.—This method of *sprinkling filings*, is recommended generally for thickening deposit speedily.

* Electrotype seals are made solid by *backing* them up with lead ; the usual method is first to rub them with rosin, and then melt some solder on them, afterwards pouring on the melted lead. But there is much difficulty in inducing the solder to *spread;* this is obviated by using a little *stearine* instead of rosin, first warming the seal. For this simple but effectual method, I am indebted to the Rev. Mr. Lockey.

VOLTAIC APPARATUS TO BE USED.

36. The moulds thus prepared are fitted to fill the place of the negative or copper plate, in the generating* cell of a simple constant voltaic pair ; (§ 17.) or of the negative plate in a decomposition † cell. In either case they occupy the place where hydrogen is evolved, if the liquid is acid water ; (§4, 11.) and where copper is evolved, if this acid water contains sulphate of copper. (§ 17, 12, 13,)

37. For the simplest mode of obtaining an Electrotype medal, the reader is referred to the description given (§ 3.) of a single voltaic pair. Instead of using the copper-plate as there described, attach (§ 27.) to the end of the wire one of the fusible moulds, (§ 26.) Bend the wire into the shape of the letter ∩, so that the mould shall face the zinc :—wrap the zinc in a piece of brown paper ; pour within the paper some salt and water, or some water very slightly acidulated with sulphuric acid ; and immerse the whole into a vessel containing a saturated (§ 19.) solution of sulphate of copper.

38. This apparatus will represent a single cell of a constant battery ; (§ 17.) not constructed on the best principles, it is true, but sufficiently so for an introductory experiment. The copper of the solution will be released on the fusible mould ; (§ 17.) after five minutes immersion the mould will be covered with a very brilliant coating of pure metallic copper ;—after thirty hours, or less, with proper arrangements, (§ 50.) this coating will be thick enough to remove :—when removed, it will present a perfect resemblance to the original medal.

39. To complete, however, the character of this constant voltaic pair, the zinc must be amalgamated ; (§ 19.) and a more convenient diaphragm than paper must be employed. (§ 44.)

* This term is applied to that cell containing the single voltaic pair of zinc and copper, or other metal. (§ 3.)

† This term is applied to the second cell, into which the terminating wires (§ 11, 12, 13.) are brought.

40. Besides the *electric* action on common zinc, the acid acts on it *chemically:* —whether the former action be going on or not, the latter will not cease, so long as there is any zinc to be acted on, or any acid to act on it. This arises from the quantity of foreign matter contained in the zinc of commerce :—this matter, which is mostly metallic, forms, with the particles of zinc, very many small voltaic pairs, all acting independently of the negative plate, (§ 3, 17.) and at the expense of the zinc and acid. *Pure* zinc is not thus destroyed.*

41. The process of amalgamation is this: —place some mercury in a saucer or plate; pour on it some water and sulphuric acid; brush the liquid and mercury over the surface of the zinc, till the whole is covered with a *bright* coat of mercury.

42. Before describing the diaphragms, I may mention the mode I have adopted for casting the zinc. Take a common hearthstone; soak it in water to soften it; then cut in it as large a cavity as it will admit of, about half an inch deep. Melt cuttings of zinc in an iron ladle, over a good fire; lay the bent end of a copper wire in the hearthstone mould; and pour on it the melted zinc.

43. Diaphragms.—Paper is very inconvenient in experiments of any duration: it seldom, perhaps never, prevents the partial mixing of the liquids it is designed to separate; and its use is always attended with a great waste of the sulphate of copper, the metal from which is released in great abundance, and deposited within the folds of the paper. The same may be said, though in a less degree, of animal membrane. (§ 17.) Either will do very well for solitary experiments; but both are inconvenient, when the experiments are continued. Something more substantial, and more durable is requisite. For this purpose porous tubes have been constructed of the material used for butter coolers: others have been made of pipe-clay. These are very convenient for diaphragms.

44. Those who are engaged in making a collection of medals may find it convenient to construct their own diaphragms of plaster of Paris. An oval groove, a quarter of an inch wide, whose external diametres are three inches and two inches, is cut in a piece of chalk or Flanders brick; into this is poured melted lead, to form an oval *collar* of lead. When cold, it is removed. Two pieces of sheet copper are wrapped, the one round the outer edge and the other round the inner of this collar. The height of the copper round the inner edge is half an inch less than the other. An oval bottom of copper is cut to fit this inner sheet, when it is fitted on the collar of lead. The whole is carefully secured into form; and is placed standing with the lead downwards. Plaster of Paris is then mixed with water and poured into this mould: it fills the space *between* the sheets of copper, and that *above* the oval bottom of the inner sheet; when the plaster is set, the outside of the mould is unwrapped, and taken off; the collar of lead is slipped off; the oval piece of copper is drawn out by means of strings previously attached to it; and the inner sheet of copper is compressed a little, and carefully drawn away. The plaster used for this purpose is the common kind employed by builders. If possible, it should be *quite new and fresh,* The value and durability of the diaphragm depends vey much upon this. The method of mixing described above (§ 35.) should be observed.

45. These casts are very durable; and will be found a great acquisition to those, who, from local circumstances, may not be able to obtain other kinds of porous ware. They are as good as *all* other diaphragms; better than a very large proportion; more economical than any.

46. If in the introductory experiment already described, (§ 37.) the amalgamated zinc and these diaphragms be employed, a constant battery is obtained, with all its parts complete. And if, in addition, a bag of crystals of sulphate of copper be hung in the blue solution, in order to recruit its strength which is exhausted in proportion to the copper released, the action may be continued for days or even weeks. And by removing the mould as soon as a sufficient thickness of copper is obtained, and supplying its place by another, three or four medals may be copied in a week. The acid water around the zinc must be occasionally renewed.

To be Continued.

* It may be obtained at the Instrument-Makers' prepared for Electrotype purposes.

GOSSIP.

It is with much pleasure that we give a conspicuous place to the following notice to Daguerreotypists. If the reward therein offered does not stimulate our artists to greater exertions for the improvement of their art, we shall be greatly disappointed in our estimation of the talent and energy engaged in the business.

All must be aware that Mr. Anthony was for a long time practically engaged in daguerreotyping, and that ill health superinduced by his labors in the art, obliged him to relinquish it; but unwilling to lose sight of an art to which he was wedded both by taste and inclination, he chose—in preference to any other—the daguerreotype stock business.

The difficulties and perplexities to which he, in common with all Daguerreans, was subjected in the various manipulations of the art, and which he is convinced may be, in a great measure at least, obviated; particularly those parts which prey so seriously upon the health of the operator. With this view, after waiting a considerable length of time for the movement of some gentlemen more intimately connected with the business, but in vain—he has, with that liberality of spirit for which he always has been known, concluded to make the offer contained in the card below, which we extract from the "United States Journal."

Our columns are always open for any suggestions or communications on the subject with which we may be favored by Daguerrean artists, and Mr. Anthony has made arrangements to answer, in the Journal, all letters on the subject directed to him.

The prize is a handsome one, and well worthy the attention of every Daguerrean artist throughout the world. Let none, from a sense of modesty, or from a wrong impression of want of ability, neglect to strive to secure it. Mr. Anthony's well known character is a guarantee of the sincerity of the offer; that of the judges, that no undue partiality will be shown in the decision.

To all interested in the advancement of Photography.—Having always felt a deep interest in the progress and improvement of the Photographic Art, I have been induced, for the sake of stimulating invention and discovery in this department, to offer a reward of *five hundred dollars* for the most important improvement in practical Photography, that shall be effected during the current year, 1851.

There will be no restriction as to the *nature* of the improvement. It may be in arrangement of light—in preparation of plates—in the manufacture of materials—in the arrangement of the chemical department so as to promote the health of operators—in improvement of lenses—in the construction of apparatus—in the manufacture of a superior paper for Photographic purposes—in simplifying the paper process—or in anything that has a direct tendency to advance the great discoveries of Talbot and Daguerre. An essay that shall point the way to valuable improvements will be regarded as a fair subject for reward.

There will be no restriction as to the *nationality* of the competitor. The claims of England, France, and Germany, will be regarded as impartially as those of America.

No subject for competition will be received after the 31st day of December, 1851, and the decision shall be made as soon thereafter as the judges shall have been enabled to agree upon the successful candidate.

The following eminent gentlemen have kindly consented to act as judges. Their world-wide reputation will be sufficient guarantee of their strict impartiality.

Prof. Sam'l. F. B. Morse, inventor of the Electro Magnetic Telegraph.

Prof. John W. Draper, of the New-York University.

Prof. James Renwick, of Columbia College.

All communications on the subject must

be *post paid* as none other will receive attention.

All explanations that may be asked will be made in the Photographic Art Journal of New York, the editor of which has kindly offered its columns for the purpose.

All communications marked "private" shall be regarded as strictly confidential.

EDWARD ANTHONY,
308 Broadway, New York.

This annoucement has been forwarded to Europe, and appears simultaneously in London, Paris, and the United States.

— THE HILLOTYPE.— Since our last issue we have seen several gentlemen who have called upon Mr. Hill at his mountain home, all of whom express their firm belief in his having made the discovery to which he lays claim. Although we advise all to have patience for the full development of this great improvement, we cannot censure the complaints to which the delay gives rise. We have no doubt, however, that Mr. Hill is as anxious to bring it out, and reap the pecuniary benefits he must derive from it, as our Daguerreotypists are to obtain the process.

To the numerous questions put to us in regard to the matter, we must reply, that we know nothing about the time fixed upon for the promulgation of the secret, other than that Mr. Hill has said that it would require six months to perfect the manipulation so as to enable him to teach it to others. Of the precise course he intends to pursue in disposing of the secret to operators we are also ignorant, except so far as he publishes his views in his circular.

There are many rumors abroad for the truth of which we cannot vouch, but they are in such direct opposition to Mr. Hill's declarations, both to us privately, and in his published letters, that we cannot give them credence. We shall be very much and disagreeably disappointed in the man if one solitary item of these rumors prove correct. The most important of these is, that a distinguished Daguerreotypist, and an extensive dealer, have so ingratiated themselves into the good graces of Mr. Hill, and have rendered him assistance of such a peculiar nature, that it will be impossible for him to avoid granting them an interest in the invention, and a control over its disposal. This control, it is rumored, they intend to wield in a manner most conducive to the pecuniary health of their capacious and already oveflowing pockets.

Now, when we have Mr. Hill's word for it, that he will only dispose of his invention, in the most democratic way—in a manner that will produce the greatest amount of good to the greatest number—and when we know that an offer has been made to him that carries out his views to the very letter ; an offer by which he can realize a fortune on the instant, and yet have the privilege of practising his discovery whenever it may please him; when we know this, we say, we cannot believe that these rumors have any foundation in truth, notwithstanding they have been asserted and maintained with such pertinacity by two or three who pretend to be so intimately acquainted with Mr. Hill's intentions, and the trap into which he has fallen, which was set by the persons to whom we have already alluded.

If these rumors do prove correct, and such a co-partnership is formed, we have some revelations to make, which may be of benefit to Daguerreotypists in that event; but until we are positively informed by Mr. Hill himself, of the facts being as rumored. we shall put no faith in the idle gossip.

—In the Art-Union Bulletin for April is an article in reply to Mr. Harrison's strictures—published in the February number of this Journal—on that institution, in which a few typographical errors in Mr. Harrison's article are attributed to his ignorance. In justice to Mr. Harrison we take pleasure in stating that the orthography of the

words in question was correctly given, and that the errors of the compositor were corrected in the proof, although he neglected to make the alterations in the form before it went to press.

—In Mr. Harrison's article "The Art-Union and the National Academy," the most glaring errors occur in the names of some of our most celebrated painters; viz, "*Truman*" should read "*Inman*"—"*Wilkey*" should be "*Wilkie*"—"*Alison*" should be "*Allston*." The others are unimportant.

—We have also to apologize to Mr. Morand for the misplacement of a line in his biography. Feeling sure that the error was not in the proof sheet sent us, we examined it, as also the *revise*, and we there found all correct. There is, therefore, but one way to account for it, and that is by attributing the alteration to the unpardonable carelessness of the pressman, in misplacing the lines after the form went to the press-room. In the same article *Rev. J. P. Kidder* should read *Rev. D. P. Kidder*. It is very annoying to be obliged to make these apologies, but in all these cases the errors were placed beyond our control by the neglect, in one instance, of the compositor, and in the other by the design, apparently, of some one whom we shall endeavor to discover.

—In order to meet the wishes of a large number of our subscribers we are induced to postpone awarding the premium for the best daguerreotype until the first of January, 1852. We must, however, inform our friends, that we cannot delay it longer than to that period.

—To J. H. F———g, of Mo., we will say that it is no fault of ours that he has not received the Art-Journal regularly since the publication of the first number. We wrote to him previous to its commencement—as we did to several other of our personal friends, whose influence we were desirous of securing, but received no answer. We also stated in our January "Gossip" that we should continue to send to those only who subscribed, and we have invariably adhered to that course. We assure him that we are highly gratified at the receipt of his subscription, for it is to the first Daguerreotypists of our country that we must mainly look for support in our undertaking, as their patronage must, naturally, inspire confidence in the minds of those less successful in the art, but who are sincerely desirous of improvement.

ON SEEING MR. ANTHONY'S PORTRAIT OF JENNY LIND.

BY MRS. ANNA L. SNELLING.

'Tis true to life! in every line we trace
The quick emotions of her radiant face,
The mild, firm lips, the genius-lighted eye,
The brow of lofty thought, serene and high!
In gazing thus we almost dream the while,
Those lips are parting with their wonted smile,
That heavenly voice in fancy we can hear,
Breathing the welcome to her friends so dear.
But more than this—Oh, matchless child of song!
Once more the raptured soul is borne along
On the full tide of melody to rise,
As if on seraph pinions to the skies!
The chiseled features of the loveliest face—
The form of symmetry and matchless grace—
What are they to the bright, o'ermastering soul,
Subjecting all things to its sweet control!
'Tis thus with thee—thy features in repose,
Might lack the brilliant coloring of the rose,
But genius lends them that celestial ray
Nor time nor change can ever take away.

—L. is informed that the engraving of the United States Senate Chamber, which we offer as a premium for five *yearly* subscribers, is the one published by Mr. E. Anthony, the price of which *is ten dollars*. It is a prize worth striving for: In order to obtain it five subscribers must be sent to us with the money for one year's subscription for each. Five artists might club to-

gether and afterwards decide by lot to whom the engraving shall belong.

In order that our friends may become intimately acquainted with the nature of the prize we append a history and full description of the engraving:

The design of this great National work of art was first conceived, and preparations for its execution commenced, in the winter of 1842. In the midst of very many difficulties, and at very great expense, the work was steadily carried forward to its completion, and was first presented to the public in the autumn of 1846.

A few copies were then struck off, but the demand that sprung up immediately on its appearance was so great, that it was evident that the plate would not supply it, unless the character of the engraving were changed from simple mezzotint to a composition of line and mezzotint. The printing was immediately stopped, and the plate put again into the hands of the Engraver, to add to its beauty and national interest the character of durability. After the lapse of nearly a year, the printing was again commenced, and the subscriber now calls the attention of the public to the work, with the confidence that he can supply the orders with clear and beautiful impressions.

It will be perceived that the peculiar nature of the subject gave rise to very many difficulties, which are not experienced in ordinary works of art. The grouping of so many figures in a manner where a reference to favorable position for likenesses necessarily interfered with those which would have produced a more pleasing general effect, formed a serious obstacle in the way of the Artists who were engaged upon the work, but one which it is thought they have happily surmounted—at least to a very great extent.

The magnitude of the task will be still better appreciated when it is borne in mind that all the heads have been accurately copied from daguerreotype Likenesses, which in many instances were not to be procured without great difficulty and expense.

The details of the engraving were also copied from Photographic pictures, so that it is hazarding little to say that the fidelity of the entire work admits of no question.

The scene intended to be represented as far as it was practicable, is that which took place on the occasion of the retirement of Mr. Clay from public life in 1842. Very nearly all the members of the session are represented in their appropriate seats; while in the lobbies and gallery are many persons of distinction, ex-Senators, Members of the Cabinet, prominent Representatives from the Lower House, and others introduced as spectators.

A few slight anachronisms have been intentionally committed, which contribute to the interest of the scene, without materially detracting from its historical accuracy.

The Steel Plate, which is engraved in the Mezzotint style, measures thirty-two by forty inches, and is one of the largest ever executed. It contains nearly 200 accurate portrait of some of the most eminent men of our country.

The numerous and unqualified encomiums with which the first appearance of the print was greeted by the press, was in the highest degree gratifying to all who had been concerned in the execution of the work. Among those journals—the high-toned character of which rendered their praise peculiarly valuable—was the *National Inteligencer* of Washington, from whose columns the following article is extracted:

"A Splendid Monument of American Art.—We have rarely experienced somuch pleasure as we received in looking upon the proof copy of the magnificent engraving of the United States Senate, in which are represented about one hundred eminent persons of our country. We have been aware for several years that such a work was in progress, but we had no idea that the result would be so satisfactory, so *admirable*. It marks an era in American art, and reflects the highest credit upon every one connected with its production. In delicacy and strength this engraving rivals the finest mezzotints of Europe, while in size and in number of accurate likenesses, it has never been equalled. Indeed, the precision with which the features and expressions of so many persons have been transferred to the engraving is truly wonderful, grouped as they are in every position, and of course in a manner often unfavorable to the preservation of the likeness. Many of our readers have felt a deep interest in the success of this work, and those who saw it in the lobby of the Senate and

of the House, were equally surprised and gratified. The obstacles that have been surmounted in executing this picture, were greater than we supposed, and we cannot but again express our admiration at the perfection of the whole; which unlike any preceding work of the kind, was not engraved from a complete original drawing or painting, but from detached portions, with only a general outline of their combination. Each likeness has been engraved from a single Daguerreotype taken for the purpose, and in like manner the various sections of the Senate Chamber, with the aid of the sketch of the whole effect in oil colors. During nearly four years this enterprise has been in progress, and each session of the first three years, Messrs Anthony and Edwards were engaged in the Capitol taking likenesses and views of the Senate Chamber for the purpose. Their design was noble, but many were incredulous of their ability to finish so arduous an undertaking—indeed, after two years effort it was nearly relinquished. But the task is accomplished, and Messrs. Anthony, Clark & Co. (such is now the style of the firm) have given to the country and the world a work of art with which any artist might be proud to have his name connected. The copy we have seen is one of the first impressions. The engraving will not be published until the first of September, and the proprietors have wisely and modestly deferred asking for subscriptions till they could place before the public the perfect work. We sincerely hope, and we believe they will be richly repaid for their long labor and great expense This picture marks the *second* age of our country, as Trumbull's "Declaration of Independence" did the *first*. We cordially commend it to all whom we may influence."

—We have already stated in a former number that we will pay liberally, when required, for valuable communications to the Photographic Art-Journal---and we will pay according to the utility and value of whatever communications we may accept. Our correspondents must state, however, when they send us an article for publication whether they wish to be so paid or not. We are not of those who think that a man should part with the secret of any new discovery or improvement to his fellow men without a consideration, and we do not expect it. There are many who consider the honor of being the first to develop and publish a new system, application, or theory, as sufficient remuneration, and such men are worthy the highest niche in the temple of honor and fame. But there are others who really cannot afford to be thus liberal, and to such no reasonable person should object to award not only "the full mede of praise" but a fair equivalent for his trouble and expense in producing whatever valuable improvement he may claim. We shall be pleased at all times to receive from our friends any hints, suggestions or advice that may suggest themselves, and we trust the many promises we have received regarding these matters will be speedily carried out, both for our sake and the benefit of our large list of subscribers.

—To those desiring the publication of their biographies and portraits in the Journal we will state that it will be necessary to communicate with us on the subject as early as possible in order that we may assign to each his month, there generally being several engaged ahead, and we are obliged to adopt the very good practice of serving applicants in the order of their application. We deem it necessary to state this much that there may not be any misunderstanding in the matter.

—Since the first part of our present "Gossip" was written we have received several written and verbal communications requesting us to give our views and opinions regarding the "Hillotype" discovery, and not confine ourselves so exclusively to the assertions and rumors which are daily set afloat. Our friends at the South are particularly anxious on this point, and the desire has become so universal, that, although we cannot perceive its importance,

we feel that it has become our duty to give free expression to what we consider the true position of the Hillotype discovery. This we shall do in our June number, as the present is too near its issue to permit our doing so now. So far as we have expressed ourselves in former numbers of this Journal we have said what we conceived, and still consider, to be the truth; but we freely confess that we have not said *all* that we have *felt*. It has been our desire, and still is, to render Mr. Hill all the assistance in our power to further the speedy perfection of his discovery; but our Southern friends do us injustice when they attribute this desire to any *collusion* of *interest* between Mr. Hill and ourself. We have derived not the slightest benefit—in any respect whatever—from the course we have pursued in the matter; nor have we been led to expect any. On the contrary we believe that in a measure our interests have suffered—most unjustly, we think—by expressing our honest convictions in our former numbers, but we also believe that time will produce a change in the minds of those Daguerreotypists who now feel disposed to censure us, and that they will do us justice. They may depend upon it, we shall not shrink from giving candid statements, for or against whatever may be brought forward as new in the Daguerrean art. If we err at any time it will be from want of judgment on our part, or misstatements on that of others. We shall strive to do right.

—Our friend H., of Ill., is informed that his first letter having been dated and postmarked at Dubuque, Iowa, the first numbers of the Journal were forwarded to that place. On the reception of the second letter duplicate copies were sent as directed, and the non-receipt must be owing to the carelessness or dishonesty of some post office official.

—"I am going to take pictures for thirty-seven and a half cents! *Kill* the daguerreotype business in that place and then leave it." Such were the words we heard issuing from the mouth of a daguerrean machine—we will not say artist, for it requires taste and skill to be an artist, and one who can so wantonly degrade so beautiful an art can be possessed of neither. In fact we must apologise to all worthy machines for classing him among them, for he is totally unworthy of so honorable a position—we should have said, *botch*. The last part of his sentence, however, was very grateful to our ears, and we could not refrain from answering, "the sooner the better, if you mean the business." As to his "killing the business" we think that he flatters himself, and that, on the contrary, having killed his own reputation as a photographer, he is obliged to quit it, his customers undoubtedly congratulating themselves at the event. It almost makes us weep to see such men pursuing so beautiful an art, and we cannot avoid giving vent occasionally to our feelings.

—At the Annual Meeting of the National Academy of Design, the following Associates were promoted to the rank of *Academician*, viz.—Thomas Hicks, Geo. A. Baker, H K. Brown, J. F. Cropsey, T. Addison Richards, Regis Gijnoux, P. P. Duggan, Alfred Jones, D. M. Pratt, J. W. Casilear, James Smillie and Geo. W. Flagg. At the same time, R. W. Hubbard, Jerome Thompson and Vincent Colyer were chosen Associates, and F. O. C. Darley, J. M. Falconer, Thomas Lacombe, E. Ruggles and M. M. Kellogg—Honorary Members.

—Our friend J. K. Fisher, Esq., has removed his Studio to 179 Broadway. He has some beautiful copies of the old masters, well worth seeing. He will take pleasure in showing them to any of our readers.

Lith. of F. D'Avignon 323 Broadway, N.Y.

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L. H. Hale

THE

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RESEARCHES ON LIGHT.*

BY ROBERT HUNT,
Secretary to the Royal Polytechnic Society.

PART II.
The influence of the Solar Rays on compound bodies, with especial reference to their Photographic application.

SECTION II.—*On the Action of the Solar Rays on Vegetable Substances.*

It may be proper to mention that the garden-pots in which these roots were planted, were filled with a mixture of fine earth, sand, and well-rotted manure from a hot-bed. A few days after their exposure, those under the orange and yellow glasses threw up several fungi, and continued for some days to do so, which was not the case with any of the others.

Under the ruby (1.) and red glasses (2.), the tulips shot up a *single lobe*, which maintained a little life for three or four weeks, but never rose more than two inches above the soil. There was a marked redness upon this stunted formation, which I often fancied was in some respects characteristic of the kind of medium under which they were placed. The tuberous roots perished in the soil; sufficient moisture and warmth had called into action the latent principle of germination, but being unable to maintain it against the destructive influence of the Light, they rotted.

Beneath the green glass (6.) the plants all of them grew slowly, but tolerably strong. They were, however, marked by a more extraordinary length of stem than those before mentioned; some of the stems of the ranunculuses being above ten inches in length, having a small leaf at the end not more than two-thirds of an inch in diameter. These plants all showed flower-buds, but none of them could be made to flower, notwithstanding the greatest care and attention was bestowed upon them; the effort of throwing up the buds appeared to exhaust their powers, and the whole of these plants soon died.

The results under the blue glass (5.) were very different; the roots germinated, I think, a little less quickly than they did in the open ground, forming compact and healthy plants, developing their flower-buds strongly, and flowering in perfection.

Numerous experiments have been tried with the seeds of mignionette, many varieties of the flowering pea, the common parsley, and cresses; with all of them the results have been similar to those already described. The seeds have germinated, in general, the most rapidly under the red glass (2.), in the spring of the year, but when the heat of summer has advanced, the temperature of the red Light has been too great, and germination has been prevented. Except under the blue glass, these plants have all been marked by the extraordinary length to which the stems of the cotyledons have grown, and by the *entire absence of the plumula.* No true leaves forming, the cotyledons soon perish, and the plant dies. Under the green glass (6.) the process of germination has been exceedingly slow, and the plants, particularlarly the cresses and mignionette, have speedily died.

Under the blue glass (5.) alone has the process gone on healthfully to the end;

* Continued from No. 5, page 268.

and although I have found a few instances of a perfect plant under the yellow glass (4.), it has not on any occasion yet endured to the formation of a flower; excepting the plants under the yellow and blue glasses (4. and 5.), all have been more or less etiolated.

The results, in those cases where fluid media have been used, from the more perfect isolation of the rays which have been thus obtained, have been much more decided. Under the influence of the Light which has been subjected to the absorptive powers of the yellow fluid (B.), *germination has been entirely prevented.* Under the red fluid (A.), in some cases, germination has commenced, but the young plant has speedily perished. Under the green (C.), the plant has been developed, but in a very weak state, with pale leaves and nearly colorless stalks; but under the influence of the blue (D.), the most perfect plants have been produced, and through all their stages maintained in the most luxuriant state. These experiments sufficiently prove, that the process of germination is obstructed by the influence of LIGHT on the surface of the soil, although the bulbs and seeds have been buried some depth beneath it. The effects of HEAT, as exhibited by the red rays, are not, I think, to be regarded as destructive in themselves, as plants have been found to grow under the influence of these rays when they have been supplied with an extraordinary quantity of water, to supply that drawn off by continued evaporation; whereas, although the evaporation, which has been equally rapid under the yellow media, has been met in the same manner as under the red, it has produced no beneficial results.

One very remarkable result must be noticed. Under all ordinary circumstances plants bend in a very decided manner *towards the Light.* In all my experiments with red fluid media *they have as decidedly bent from it.* I do not know how to explain this as the effect of mere heat; it would appear that some property resides in the red rays which acts in opposition to the general law. Further investigations are required on this point.

It has been stated by Dr. Draper that he has found, under the influence of the bright sun of Virginia, that plants have grown well in Light which has been made to permeate a considerable thickness of an intense yellow solution. I am not certain if the germination of seeds has been effected under the same circumstances; but even if they have been made to germinate, it admits of explanation. The fervent rays of southern climes would permeate media, by which the subdued rays of our latitudes would be obstructed. In proof of this I may remark that, during the height of the splendid summer of 1842, I was myself successful in procuring the germination of a few seeds in the box (B.), or under the influence of the yellow Light. At the same time some very remarkable photographic results were obtained, which distinctly proved the atmosphere to have been in such a condition, that a larger quantity of the sun's rays were enabled to penetrate it and reach the earth. It was also observed that the foliage of all trees was of a much darker green, and that many flowers, particularly those of a pink or pale red color, generally assumed a particular and decided blue or lilac tint.

The soil in which the plants grew, was the same in each of the boxes used, but it was several times observed that, under the yellow glasses and fluids, fungi made their appearance. From the occurrence of these vegetables under the same circumstances on several occasions, I was naturally led to observe their production with greater care. I could not, with the utmost attention, make the *Agaricus muscarius* grow behind any other absorbent media than the yellow, under which it grew luxuriantly. This appears, in some measure, to explain the popular notion, that mushrooms and plants of that variety, grow most abundantly under the influence of bright moonlight. It has never yet been found that any heat comes with the rays of the moon, and the amount of chemical action which has been detected is exceedingly small; we must therefore regard the moonbeams as consisting almost entirely of the luminous rays, the other active rays being in all probability absorbed by the moon's surface.

It is not at present in our power to explain, in any thing like a satisfactory manner, the way in which the luminous rays act in preventing germination. The changes which take place in the seed during the process have been investigated by Saussure: oxygen gas is consumed, and carbo-

nic acid is evolved; and the volume of the latter is exactly equal to the volume of the former. The grain weighs less after germination than it did before; the loss of weight varying from one-third to one-fifth. This loss of course depends on the combination of its carbon with the oxygen absorbed, which is evolved as carbonic acid. According to Proust, malted and unmalted barley differs in the following respects:—

	Unmalted.	Malted.
Resin	1	1
Gum	4	15
Sugar	5	15
Gluten	3	1
Starch	32	56
Hordein	55	12

This shows that the insoluble principle hordein is, in the process of germination, converted into the soluble and nutritive principles starch, gum, and sugar. We are therefore at present left in considerable doubt; we can only suppose that the luminous solar rays act, as indeed we find them to do on many of the argentine preparations, in preventing those chemical changes which depend upon the absorption of oxygen. A like interference has been observed by Sir John Herschel to be exerted by the extreme red rays of the spectrum; and, from the manner in which germination is impeded in the seeds covered by a deep red media (58.), we may trace a somewhat similar influence.

I have endeavored, but as yet without being successful, to ascertain the real use of the cotyledon. Mrs. Ibbetson attempts to show that it is of no use for the purpose of nourishment, but that its office is merely to screen the first leaves from Light and air. I am rather inclined to regard them as the lungs or gills of the young plant, in which, under the influence of the solar rays, the decomposition of air and water is effected. I shall not, however, in the present stage of the inquiry, venture on any further speculations on this matter.

CHAPTER II.

The Aeration of Plants.

For the discovery that oxygen gas is exhaled from the leaves of plants during the day-time, we are indebted to Dr. Priestley; and Sennebier first pointed out that carbonic acid is required for the disengagement of the oxygen in this process. M. Theodore de Saussure and De Candolle fully established this fact.

The following experiments, which are but modifications of those of De Candolle, will place the matter in the clearest light:—A bell glass was filled with distilled water and inverted in a plate of oil; fresh gathered leaves and young sprigs were previously placed in the water; another similar glass was filled with water strongly impregnated with carbonic acid gas, in which the same kinds of leaves, &c. were placed, and this was likewise inverted in oil; a sprig of mint was placed in a bottle filled with carbonic acid, a bent tube was inserted through the cork, and this tube carried into a vessel also filled with carbonic acid; the bottle was inverted in a vessel filled with mercury. These arrangements were exposed to bright sunshine. In the glass filled with distilled water no oxygen gas was discovered; but in the other, pure oxygen gas was speedily set free; and in the bottle containing carbonic acid, which was exposed for many days, under the most favorable circumstances, a considerable quantity was collected. Now it is very evident that the oxygen must have been produced by the decomposition of the carbonic acid, effected by the leaves, under the influence of the solar beam.

The woody fibre of plants, and all the carbon which is found as an elementary constituent of the resins, gums, juices, &c., of the vegetable world, is derived exclusively from the atmosphere, to which it is supplied by the respiration of animals, and all those processes of combustion which are continually going on.

By some peculiar function, the leaves of plants during every moment of their lives are absorbing carbonic acid. It has been stated that the reverse of this takes place during the hours of darkness, and that at night the leaves absorb oxygen, and exhale carbonic acid. It appears to me that this statement has been made without sufficient consideration, or the requisite experimental evidence. "This reversal at night," says a most talented philosopher, "of what was done in the day, may, at first sight, appear at variance with the unity of plan which we should expect to find preserved in the vegetable economy; but a more attentive examination of the process will show that

the whole is in perfect harmony, and that these contrary processes are both of them necessary in order to produce the result intended." He then, evidently feeling the difficulty of the question, proceeds to explain this harmony as follows. "The water which is absorbed by the roots, generally carries with it a certain quantity of soluble animal or vegetable materials, which contain carbon. This carbon is transmitted to the leaves, where, during the night, it is made to combine with the oxygen they absorb. It is thus converted into carbonic acid, which when daylight prevails is decomposed; the oxygen being dissipated, and the carbon retained. It is evident that the object of the whole process is to obtain carbon in that precise state of disintegration, to which it is reduced at the moment of its separation from carbonic acid, by the action of solar light on the green substance of the leaves; for it is in this state alone that it is available in promoting the nourishment of plants, and not in the crude condition in which it exists when it is pumped up from the earth, along with the water which conveys it into the interior of the plant. Hence the necessity of its having to undergo this double operation of first combining with oxygen, and then being precipitated from its combination in the manner above described." These passages are selected, not with any view of reflecting upon their accomplished author, but because they afford the best expression of the views which have been generally entertained on the strength of the experiments of Saussure and Grischow, which admit of another explanation.

It is only the green parts of plants which absorb carbonic acid; the flowers absorb oxygen gas. Plants grow in soils composed of divers materials, and they derive from these, by the soluble powers of water which is taken up by the roots, and by mechanical forces carried over every part, carbonic acid, carbonates, and *organic matters containing carbon* (?) Evaporation is continually going on, and this water escapes freely from the leaves during the night, when the functions of the vegetable, like those of the animal world, are at rest, and carries with it carbonic acid. "A cotton wick," says another experimental philosopher, "inclosed in a lamp which contains a liquid saturated with carbonic acid, acts exactly in the same manner as a living plant in the night. Water and carbonic acid are sucked up by capillary attraction, and both evaporate from the exterior part of the wick." And this is the true exposition of the matter.

A plant placed in a vessel containing water impregnated with carbonic acid, and carefully closed, so that no water could escape by evaporation except through the plant, was placed under the receiver of an air-pump in which was put some pure potash, and a good exhaustion effected. The potash was found to have absorbed carbonic acid. The same arrangement was made, only that the water now used was *distilled*. Under the same circumstances in every respect, a like quantity of moisture was found to be absorbed by the caustic potash, but of course no carbonic acid.

Precisely similar arrangements were placed under bell glasses filled with atmospheric air, which was dried and freed from carbonic acid, by exposure to potash for some time. In neither case could any diminution of the quantity of oxygen be detected, but carbonic acid was found in the air in which the plant in the carbonated water was placed, but not a trace in that which surrounded the plant in distilled water. I need not say that these experiments were made in the dark.

There is no reversion of the processes which are necessary to support the life of a plant; the same functions are operating in the same way by day and by night, but differing greatly in degree. During the hours of sunshine, the whole of the carbonic acid absorbed by the leaves, or taken up with water by the roots, is decomposed, all the functions of the plant are excited, the processes of inhalation and of exhalation are quickened, and the plant pours out to the atmosphere streams of pure oxygen, at the same time as it removes a large quantity of deleterious carbonic acid from it. In the shade, the exciting power being lessened, these operations are slower, and in the dark they are very nearly, but certainly not quite, suspended.

The experiments of Sennebier show that the most refrangible of the solar rays are the most active in determining the decomposition of carbonic acid by plants. The views of this philosopher have been generally adopted. A few years since, however,

Dr. Daubeny published in the Transactions of the Royal Society the results of some experiments which appeared to show that to the luminous or yellow rays, and not to the violet, must this influence be referred; and more recently, at the meeting of the British Association at Cork, Dr. Draper communicated a paper, in which he states that, having tried the effects of the solar spectrum upon tubes filled with water saturated with carbonic acid, and in which leaves were placed, he found that the greatest quantity of gas was set free from the fluid placed in the yellow ray, thus apparently confirming the statement of Dr. Daubeny.

Since this announcement, the very gloomy and uncertain state of the weather, has almost entirely prevented my testing the correctness, or otherwise, of Dr. Draper's results. During a few faint gleams of sunshine I have repeated the experiments in Draper's own method, and I have found that *bubbles of air* have been liberated in the tubes under the influence of the yellow and red rays, but they have been *carbonic acid.* In the tubes which were placed in the blue and violet rays alone, a perfect decomposition had taken place, and the bubbles which were collected were *pure oxygen gas.*

Experiments have been made with absorbent media, the Light which has been carefully analysed, permeating under the influence of the blue Light: in every instance oxygen gas has been collected, but not any under the energetic action of yellow and red Light.

However, from the first development of leaves, until the perfect maturity of the plant, these processes which we have been considering are continually carried on; and not these only, for it is evident that the same agent is active in producing the decomposition of water, and I also believe of ammonia, from which the plant derives the hydrogen and the nitrogen it requires for the formation of its several principles.

We have now certain knowledge. We know that all the carbon which forms the masses of the magnificent trees of the forests, and of the herbs of the fields, has been supplied from the atmosphere, to which it has been given by the functions of animal life, and the necessities of animal existence. Man and the whole of the animal kingdom require, and take from the atmosphere, its oxygen for their support. It is this which maintains the spark of life, and the product of this combustion is carbonic acid, which is thrown off as the waste material, and which deteriorates the air. The vegetable kingdom, however, drinks this noxious air; it appropriates one of the elements of this gas—carbon—and the other—oxygen—is liberated again to perform its services to the animal world. It is not possible to conceive a more perfect, a more beautiful system of harmonious arrangement than this, making the animal and the vegetable kingdoms mutually dependent. The existence of the one ceases when the other is destroyed. If the vegetable world was swept away, animal life would soon become extinct; and if all animal existence was brought to a close, the forest would fall, and the flowers of the field, which now clothe the earth with gladness, perish in the utterness of a lamentable decay. It has been supposed that the vegetable world was called into existence long previous to the creation of animals, and to this period is referred the formation of the coal strata. There might have been an epoch when the disturbed condition of the earth—its earthquake shocks, and volcanic strugglings, may have poured so large a quantity of carbonic acid into the atmosphere, as to have rendered this planet unfit for the habitation of animals, until a teeming and most gigantic vegetation, by exhausting it for their own supply, purified the air, and rendered the more quiet earth a fitting abode for creatures endowed with reason and instinct. But such events do not appear again likely to occur, and it is not within the range of probabilities that the animal or vegetable kingdoms will ever have an independent existence.

The animal kingdom is constantly producing carbonic acid, water in the state of vapor, nitrogen, and, in combination with hydrogen, ammonia. The vegetable kingdom continually consumes ammonia, nitrogen, water, and carbonic acid. The one is constantly pouring into the air what the other is as constantly drawing from it, and thus is the equilibrium of the elements maintained.

Plants may be regarded as compounds of carbon vapor, oxygen, hydrogen, and nitrogen gasses, consolidated by the all-

powerful, all-pervading influences of the solar ray; and all these elements are the produce of the living animal, the conditions of whose existence is also greatly under the influence of those beams, which are poured in unceasing flow from the centre of our system. Can any thing more completely display a system of the loftiest design, and most perfect order, than these phenomena?

The most casual observer could not fail to remark the peculiar influences of the solar agencies, at different seasons of the year. In spring, a fresh and lively green pervades the field and forest; this in summer assumes a darker hue, and in the autumn passes gradually into a russet brown. In a very early stage of my photographic researches, I discovered a remarkable difference in the chemical action exerted by the solar rays an hour or two before noon, or an hour or two after it. I am now convinced, although it will require continued observation for many years to prove it, that the same difference is to be detected between the solar emanations of the vernal and the autumnal periods. The change in the color of the leaves appears to be entirely dependent upon the absorption of oxygen, which all the green parts of plants have the power of absorbing, particularly in the dark. This true case of chemical affinity, it would appear, goes on equally with the spring or the summer leaves; but during these periods the vital force, under the stimulus of the Light, is exerted in producing the assimilation of the oxygen for the formation of the volatile oils, the resins, and the acids. In the autumn this exciting power is weakened; the summer sun has brought the plant to a certain state, and it has no longer the vital energy necessary for continuing these processes. Consequently, the oxygen now acts in the same manner on the living plant, as we find in experiment it acts upon the dried green leaves, when moistened and exposed to its action. They absorb gas and change color.

Sir John Herschel observes, in reference to the action of Light on the juices of plants: "The earlier flowers of any given species reared in the open air, are more sensitive than those produced, even from the same plant, at a late period in its flowering, and have their colors more completely discharged by Light. As the end of the flowering period comes on, not only the destruction of the color by Light is slower, but residual tints are left which resist obstinately." These residual tints are the same which produce the brown of the autumnal leaf; and the same agent may be traced in the production of photographs upon papers spread with expressed juices, and on the changing colors of flowers and of leaves.

A remarkable example of the influence of Light upon the juice of plants, is the Cacalia ficoides, cited by Liebig. During the hours of darkness, this plant, like others, absorbs oxygen, and in the morning it is as acid to the taste as the sorrel. By the influence of the morning sun it loses this oxygen, and at noon it is tasteless, and by the continued action of the Light still more is abstracted, and the plant is positively bitter in the evening.

Experiments have been instituted with a view of ascertaining, if any particular ray of the spectrum had the power of inducing, more powerfully than others, the progress of plants towards the Light, a phenomenon which is strikingly exhibited by the potato. It would appear that the yellow or pure luminous rays exert this influence with the greatest force; but it must be admitted that the results obtained have not been so satisfactory as could be desired. Indeed, no correct conclusion can be arrived at, until the experiments are tried with the isolated rays of the prismatic spectrum themselves. I am every day more and more convinced of the defects of absorbent media in these and similar researches.

SECTION II.

ON THE ACTION OF LIGHT ON INORGANIC BODIES.

CHAPTER I.

On Phosphorescence.

We have thus far been considering Light as an emanation from the sun: how far this view is borne out by the facts discovered remains to be decided. There are circumstances which might lead us to consider Light as an essence independent, and universally diffused, and amongst these the most striking are the phenomena of phosphorescence. It has already been stated that Benvenuto Cellini observed it in gems; and a considerable degree of attention was

bestowed upon phosphori by the Honorable Robert Boyle. Many minerals have the property of emitting Light when rubbed or broken, and Sir David Brewster has observed the phenomena in upwards of fifty minerals, when they are exposed to a heat below redness in the dark. From these facts we might argue that this *essence* was capable of existing in an invisible state for any period of time; and that it would, when properly excited, produce the effect of Light.* The eminent authority just now quoted has stated, that the phosphoric Light of minerals has the same properties as the direct Light of the sun. This statement must, however, be received with some consideration, if Sir David Brewster means the undecomposed sun-beam. We have no satisfactory evidence which shows that any heat ever accompanies phosphorescent Light, and we have never discovered that it is capable of producing any chemical change. By the prism we detect the same number of colors in a phosphorescent beam as in the sun's rays; and this is all, I presume, that this talented philosopher intended to imply.

Many bodies exposed to the solar rays give out Light when examined in the dark: this is particularly the case with some flowers, as the Nasturtium; and if the human hand is held in the sunshine for half an hour, it will emit Light for some minutes in the dark. The bodies, however, which exhibit this peculiarity in the most remarkable manner, are the Bolognian stone, a sulphuret of barium; and Canton's phosphorus, which is prepared by calcining oyster shells and sulphur together. If these substances are exposed to the solar rays, they acquire the property of shining in the dark so strongly, as to enable the observer to distinguish the printed letters on the white page of a book. There are some other substances which exhibit these phenomena: Homberg's phosphorus — the melted chloride of calcium — Baldwin's phosphorus — melted nitrate of lime — the sulphuret of strontian, &c.

Some of the elder natural philosophers particularly examined the solar phosphori, especially Beccaria, who stated that the violet ray was the most energetic, and the red ray the least so, in exciting phosphorescence in these bodies.

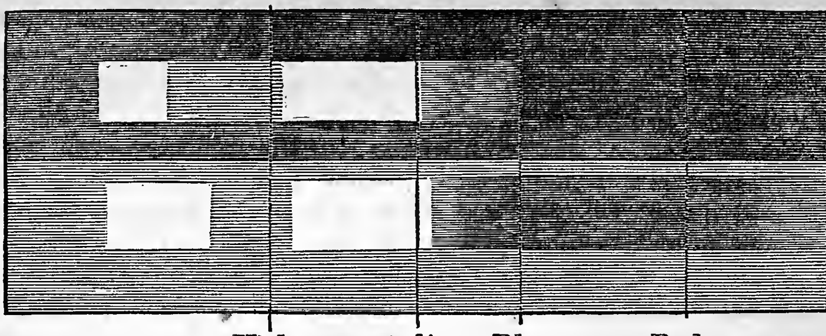
* Edinburgh Phil. Journal, vol. i.

Dessaignes has remarked that the solar-phosphori emit the same kind of light, whatever may have been the kind of Light to which they were exposed.* This is not, however, very easily reconciled with M. E. Becquerel's experiments. It has been stated by M. Grotthouss, that in some diamonds the most efficacious exciting Light is different from that excited. This observer also noticed that electrical discharges restored the property of phophorescence in cases where it was destroyed by violent heat.

M. Edmond Becquerel has particularly examined the action of the spectrum upon the solar-phosphori. The result of his inquiries has been, the determination with considerable exactness of the spaces occupied by the rays which impart phosphorescence. He states, that the sulphuret of calcium is rendered phosphorescent by the rays which extend from the indigo to a little beyond the violet; and that two points of maximum intensity are to be detected; one within the visible violet rays, and the other beyond it. The sulphuret of barium exhibits the action of the same rays, but shows only one maximum point, which is situated beyond the violet. M. E. Becquerel has also observed, that the rays below the indigo unto the red, or a little beyond it, have the power of destroying the phosphorescence which the more refrangible rays have excited. Those exciting rays, this observer is inclined to think, have a definite action, and hence he would distinguish them as the "Phosphorogenic Spectrum."

Many of the experiments of E. Becquerel are instructive. Paper being covered with gum Arabic is dusted over with the sulphuret of calcium, and exposed to the action of the spectrum. Upon examining the paper in the dark, two luminious bands are visible, *a*, *b*, *c*, *d*: these spaces correspond with the violet rays, and the "invisible chemical rays" so called; a dark space exists between these bands, which mark the region occupied by the extreme violet rays, and the lavender rays of Sir John Herschel. If this action is allowed to continue during a certain time, a quarter of an hour for instance, the diffused Light impresses the remainder of the surface over nearly all parts, so that on ex-

* Mem. Inst., tome xi.



amining the paper in the dark, almost the whole surface appears luminous, the parts *a*, *b*, *c*, *d*, being the brightest, but the space from the least refrangible violet to the lowest edge of the red rays is completely dark. The upper part of the above wood-cut shows the effect produced. It would appear from this, that the rays of less refrangibility than the indigo have the power of preventing phosphorescence, which exactly accords with Beccaria's statement.

If, before exposing the phosphorescent surface to the action of the spectrum, it is exposed for a few seconds to the solar rays, or diffused Light, it becomes luminous in all its parts. If now we project a spectrum upon it for a few minutes, and then examine it in the dark, it will be found that every part remains luminous except the part *d*, *e*, which has become dark. If the temperature of the surface is raised by a spirit lamp, all the parts previously luminous become vividly phosphorescent, whilst this part remains completely dark.

By the aid of colored glass screens, this is rendered very evident. If a piece of paper prepared with sulphuret of calcium is exposed to daylight, it becomes luminous. By placing immediately on this surface a card which partially covers it, and then a red glass permeable only to the red and orange-colored luminous rays, and the chemical rays which accompany them, and exposing this arrangement to the sun for a minute, it will be found, on examining the paper in the dark, that the part which has been acted upon by the rays has entirely lost its phosphorescence, whilst every part is still luminous. The same effect takes place if sulphuret of barium (Bologna phosphorus) is used.

These experiments distinctly prove that the obscure rays of the spectrum produce phosphorescent Light, which light is destroyed by the most luminous and the calorific rays; a fact which was previously noticed by Seebeck.*

M. Biot and the elder Becquerel have proved that the slightest electrical disturbance is sufficient to produce these phosphorescent effects. May we not, therefore, regard the action of the most refrangible rays as analogous to that of the electric disturbance? May not electricity itself be but a development of this mysterious solar emanation?

A great many animals in the living state emit Light of the character which we have been considering:—the *pholas*, the *medusa phosphorea*, and many other *molluscæ*; the *lamphyris* or glow-worm, the *fulgora*, the *scholopendra electrica*, the *cancer fulgens*, and a variety of the *annelids* found in the bogs of Ireland, may be adduced as examples. Nearly all fish in a state of decomposition emit this kind of Light; and the flesh of most quadrupeds in the progress of putrefaction. Rotten wood, it is well known, also evolves a considerable quantity of Light in the dark. The dependence, or otherwise, of these phenomena upon solar influence, remains to be proved. In the Philosophical Transactions for 1790, Dr. Hulme published a very excellent Treatise on Phosphorescence, to which I must refer those who are desirous of obtaining further information on this part of the subject. I cannot refrain from suggesting the importance of experiments to determine if any class of the prismatic rays have the power of exciting or destroying the phosphorescence in living animals. It would appear from the experiments of Becquerel, that the luminous and calorific rays should possess that power. That artificial

* See Goethe's Optics.

heat interferes with the phenomena in organised bodies is very certain. The whole question, however, is one of great difficulty, but it is an inquiry which is calculated to clear up much of the doubt which exists at present as to the theories of the emission of luminous particles, and the excitement of an all-pervading luminiferous ether.

CHAPTER II.

Influence of the Solar Rays on Chemical Combination.

Already, in the first part of this work, a great number of examples, which show the influence of the sun's rays upon combination, have been brought forward: a few instances of a remarkable kind remain to be noticed. If we take the saturated solution of any salt, and expose it, so that one portion may be under the influence of the solar rays, whilst the other is preserved in darkness, it will be found that crystalization commences sooner, and proceeds more rapidly under the influence of the Light, than it does in darkness.

Vogel observed, that if chlorine was passed into alcohol nearly saturated with that gas, and at the same time exposed to the sunshine, each bubble of chlorine, as it entered the spirit, exploded, giving a bright purple flame and a white vapor. This experiment I have many times repeated, and I have found that the effect depends entirely upon the agency of the blue rays. The interposition of an orange glass, or a yellow fluid, is quite sufficient to stop this energetic chemical combination.

It has long been known to chemists, that a mixture of chlorine and hydrogen gases might be preserved in darkness, without combining for some time; but that exposure to diffused daylight gradually occasioned their combination, whilst the direct solar rays produced the sudden inflammation of the mixture. This combination has been investigated by Gay, Lussac, and Thenard, and also by Davy. Sir Humphry Davy found that a mixture of chlorine and hydrogen acted more rapidly upon each other, combining without explosion when exposed to the red rays, than when placed in the violet rays. But he found that a solution of chlorine in water, became a solution of muriatic acid most rapidly, when placed in the most refrangible rays.

My own experiments appear to show that the combination of these gases may be effected in every part of the prismatic spectrum, but that it is entirely independent of the luminous rays. I have kept chlorine and hydrogen without uniting, behind a yellow medium, for as long a period as I have been able to preserve the mixture in the weakest diffused daylight. It does not, however, appear to be quite independent of calorific influence; for I find that the combination is speedily effected under the influence of the dark rays of heat.

We have evidence to show that the chemical agent, whatever it may be, which accompanies Light, is diffused over every part of the prismatic spectrum, although its action is modified by the luminous and calorific influences. Now, as it is proved that a very small amount of "force" will occasion the chemical combination of these gases, we can well understand that the whole of the rays possess that power, although in different degrees. Dr. Draper has shown that the Light of a taper produces a decided effect upon the mixed gases, and also that the Light emitted during the rapid passage of the electric spark, acts powerfully upon them. "For speed of action no *tithonographic** compound can approach it; a Light which perhaps does not endure the millionth part of a second, affects it energetically." In the red ray the chemical influence is pretty active, and this, combined with the thermic power of that ray, easily accounts for the phenomenon observed by Davy. I have found, however, that the combination is effected with the greatest speed by the extreme blue and the indigo rays. Dr. Draper has fixed the maximum in the indigo rays, and giving a numerical value to the forces exerted by the different rays, he calls the maximum power of the

Indigo ray	240·00
Blue ray	144·00
Violet ray	121·00
Green ray	54·00
Extra spectral rays	12·00
Yellow ray	2·75
Orange ray	·75
Red ray	·50 ?

* Tithonicity is a name given by Dr. Draper to the chemical rays; but which is, it appears to me, badly chosen; and certainly not at all in accord-

The red ray should have a much higher power than is here stated; I have found it quite equal to the green ray, and, I think, superior to it in effect. I should remark that, by using glass tubes of small bore, I secure the combination of the gases without any explosion.

Taking advantage of the action of the sun's rays upon these gases, Dr. Draper has devised an instrument for measuring the chemical force exerted by Light. This instrument consists essentially of a mixture of equal volumes of chlorine and hydrogen, which is evolved from, and confined over muriatic acid, in a graduated bent tube. The gases are liberated from the liquid acid by the agency of galvanic electricity. Platina wires, which can be connected with a voltaic battery, are inserted into the tube in such a manner, that when the required quantity of the gases is formed, the decomposition ceases, owing to the fluid having fallen below the wires. The gases combine in a longer or shorter time, according to the amount of Light; the number of degrees over which the fluid falls in the graduated arm in a minute giving relatively the force in action. This instrument is certainly a very ingenious application. But it appears to me, there are so many causes which will operate to produce a very irregular action, that the results obtained by such an instrument can only be received as approximations to the truth, and indeed not that, unless the average of a great many carefully conducted experiments be taken in every case.

The formation by the sun's rays of precipitates from the solution of platina neutralised by lime from the combination of the bichromate of potash, and sulphate of copper have already been mentioned.

In addition to these I would state, that a mixture of the hydriodate of potash and the ferroprussiate of potash will remain, without any change taking place, for a long time, in the dark; but in the sun's rays, an hour or two is quite sufficient to occasion a precipitation of Prussian blue, and the liberation of hydrocyanic acid.

As far as my own observations have gone, I find that in all cases where precipitation does not take place immediately upon mixing two solutions, there is a very marked difference in the time required for precipitation to take place in a fluid kept in the dark, and one exposed even to diffused daylight, this being, of course, more strikingly shown if one fluid is placed in the sunshine. I would refer to a former paragraph for some interesting experiments illustrating this part of the subject.

Chlorine, iodine, and bromine, it is well known, act with considerable energy upon metallic bodies. If, however, any polished metal is exposed to the action of them in a diluted state, the combination is, at first, exceedingly weak, and the films that are formed by either of these three elementary bodies, upon any metal, undergo considerable change under the influence of the sun. In most cases it appears that these bodies are set free, and the metal left in a state of very fine division or oxidisation. Copper, tin, iron, zinc, lead, pewter, bismuth, and several other metals have afforded the same results. It is still more remarkable, that films of bromine or iodine on glass are found, under the action of the sun, to act in a similar manner; and in 1841 I published an account of the power of iodine in rendering wood capable of receiving photographic images.

M. Edmond Becquerel, in 1839, first called attention to the electricity developed, during the chemical action excited by solar agency. He provided a blackened box divided by a diaphragm into two cells; in each cell he placed the fluid to be examined, and plates of platina or gold were dipped in each, and connected with a galvanometer. The cells being filled with acidulated water, and platina plates in each cell, it was found that when the red, orange, yellow, or green rays fell upon the fluids, no action was excited. The blue and indigo induced a feeble action, but a very decided deflection of the galvanometer was produced by the impact of the violet rays. In 1840, I repeated the experiments of Becquerel, with many modifications, using tubes bent into the form of **U**; or floating one photometric fluid upon another. The results I then arrived at, completely confirmed those of M. E. Becquerel; and I was led to adopt this method of measuring the permeability of bodies to the "chemical rays."*

ance with the Lavoiserian principle of nomenclature, which teaches, that the *word* should give birth to the *idea*, the idea depict the *fact*.

* See Philosophical Magazine, Feb., 1840.

Becquerel supposes the light to act on the corpuscules adhering to the surfaces of the plates. It is very convincingly proved that none of this excitement is due to calorific action. With an arrangement similar to that just described, the following results were arrived at by Becquerel when using screens of glass:—

Screens.	Intensity of Current.	Effects.
Without a screen	35·5	100
Violet glass	9	27
Blue glass	10·5	31
Green glass	1	2 5
Yellow	6 5	10·5
Red	1	2·5

Here the incorrect results obtained by colored glasses are very decidedly shown. All yellow glasses are permeable to some chemical rays; therefore, the deflection of 6·5 is to be attributed to these, and not to the luminous rays themselves. A plate of polished brass being exposed under similar conditions in various parts of the spectrum, the following results were obtained:—

Rays.	Intensity.
Red	1
Orange	0
Yellow	2
Green	4
Blue	2
Indigo	0
Violet	0

Here it would appear that the maximum effect was produced by the green rays.

The plate of brass being oxydised the effects were as follows —

	Intensity.	Effect.
Without a screen	4·5	100
Violet glass	2	44 5
Blue	1	27
Yellow	0	0

Plates exposed to iodine, chlorine, and bromine, were tried by M. E. Becquerel, and similar results obtained.

Not considering these results so satisfactory as I could desire them to be, I instituted during the summer of 1843 a series of experiments with plates of different metals, and prepared in several ways. These plates were connected with wires from the galvanometer, and the different prismatic rays were passed separately through a slit in a card, and the transient and permanent deflections carefully noted. The galvanometer was never deflected by any ray below the green, unless by the extreme red, and this was no doubt a thermoelectrical action; but in the green a weak action was always detected, which increased powerfully as we ascended into the rays of still greater refrangibility; the maximum shifting with the kind of preparation employed, between the mean blue ray and the most refrangible violet.

This action is only to be regarded as one of the evidences of chemical disturbance, exciting electrical currents; yet, at the same time, it opens the question of the identity of the agent producing this disturbance and electricity. In the present state of the inquiry, we are bound to regard Light, Heat, and Electricity, as distinct elements; and possibly we have now to add a fourth to this list of imponderable agents. In the examples already brought forward in this treatise, we see the extreme difficulty which exists in keeping separate from each other the Light, Heat and Chemical Energy of the solar rays, and the results just stated, involve the element of Electricity in the already complicated consideration.

To name and describe the numerous cases which I might bring forward of decomposition by the agency of the solar rays, would occupy much too large a space. Therefore, particularising only the decomposition of hydrocyanic acid, and of nitric acid by the sun's rays, I shall satisfy myself by expressing the law which is now established, that ALL CASES OF CHEMICAL ACTION ARE QUICKENED OR RETARDED BY THE SOLAR INFLUENCES.

CHAPTER III.

Magnetising Power of the Solar Rays.

HAVE the sun's rays the power of developing the phenomena of polarity in steel? This question has been agitated for upwards of twenty years. Dr. Morichini was the first to announce, that the violet rays of the solar spectrum had this power. The experiments were tried by collecting the violet rays in the focus of a convex lens, and exposing one half of fine needles, previously proved to be entirely free of magnetism, to the influence of these rays for half an hour. MM. Carpa and Ridolfi repeated these experiments of Morichini with the most satisfactory results, and the Italian philosopher succeeded in magnetis-

ing several needles, before Sir Humphry Davy, Professor Playfair, and others. It must, however, be stated that Berard and Professor Configliachi of Pavia failed in producing the same effects. Mrs. Mary Somerville restored the confidence of the scientific world in the results of Morichini, by a series of exceedingly beautiful experiments which were published in the "Philosophical Transactions," for 1826. Needles were ascertained to be entirely free of magnetism; they were then half covered with paper, and the exposed end placed in the violet ray of the spectrum, about five feet from the prism. In two hours, the needle was magnetised, the exposed end being the north pole. The indigo ray gave nearly the same result. The magnetic influence was imparted by the blue and green rays, but in a much less degree. The yellow, orange, and the calorific rays were tried for several days; but no magnetism was developed. Pieces of clock and watch springs gave similar results. It was also found that the same effects could be produced by exposing needles partly covered with paper to the Light which permeated cobalt blue and green glasses. Green and blue riband produced similar changes.

Baumgartner, of Vienna, discovered that a steel wire, polished in some parts and oxidised in others, became magnetic, exposed to the *white light* of the sun, the polished part becoming the north pole. The concentrated rays acted more rapidly, and in this way eight poles were obtained on as many inches of wire.

Barlocci and Zantedeschi found that an armed natural loadstone had its power nearly doubled in twenty-four hours, if exposed to the strong Light of the sun, and that an artificial magnet which carried 13½ oz. supported 3½ oz. more, after three days' exposure to sunshine; and it at last supported 31 oz. by continuing the solar action. Zantedeschi found that while the strength increased in oxidised magnets, it diminished in those highly polished. He also discovered that by concentrating the sun's rays, the magnet *acquires strength* when its north pole is exposed to them; and *loses* it when their south pole is acted on by them.

Mr. Christie found that when a magnetised needle, or a needle of copper, or of glass, vibrated by the force of torsion in white Light, the arch of vibration was more rapidly diminished in the sun's Light than in the shade; this effect being more evident on the magnetised needle.

Riess and Moser* published a series of experiments conducted with great care, which seem to throw much doubt on the results of other philosophers. They examined the number of oscillations performed in a given time, before and after the needle was submitted to the influence of the violet rays. A focus of violet Light, concentrated by a lens, was made to traverse one-half of the needle 200 times. They, however, could not detect any difference in the oscillations, which could be at all attributable to any magnetising property of the solar rays. These experiments were tried at different seasons of the year, and at all hours of the day. They also endeavored to verify the results of Baumgartner, but without success.

Connected with these researches, there appear to be many almost inexplicable phenomena, which have probably led to these discordant results. The whole series certainly require a fresh investigation. Mr. R. W. Fox, in pursuing his investigations on terrestrial magnetism, was led to observe the fact, that the oscillating needle was much affected by the sun's rays; the arch of vibration being more rapidly diminished, as was observed by Mr. Christie. These experiments were repeated by Mr. W. Snow Harris, who adopted the plan of swinging the needles in a vacuum, and this talented electrician came to the conclusion that no such retardation took place, under the exhausted receiver of an air-pump. It must, however, be borne in mind, that it is impossible to avoid the leaking in of air even with the best instruments; and this would give rise to currents which would materially influence the results.

Berzelius has stated that the results of Seebeck's experiments show, that in no circumstances do the sun's rays develop polarity in steel, which did not previously to exposure to their influence, possess magnetic properties. He therefore considers the experiments of Mrs. Somerville as illusive.

I will now name an experiment of my

* Edinburgh Journal of Science, New Series, No. IV. p. 225.; Annales de Chimie et de Physique, November, 1829.

own, and leave the matter for still further investigation. Twelve sewing needles were carefully examined, and found to be without any polarity whatsoever. These were stuck through four cards, and one half being thus screened from the Light, the other was covered with deep blue colored glasses. Three of the needles were placed magnetic east and west, and three others in the direction of the dip. The other six were washed with diluted nitric acid; and arranged, three on a card, in the same manner as the others. After having been exposed to sunshine for some hours, they were examined, and it was found that those needles which had been placed in the direction of the dip had acquired polarity, but no change could be detected in the condition of any of the others.

THE HILLOTYPE.

BY THE EDITOR.

In accordance with our promise, given in the May number of the Photographic Art-Journal, we shall now give what we consider a true and impartial statement of the present position of Mr. Hill's new discovery, reviewing carefully his published letters, and the various rumors that have been current for the last four or five months, and candidly express our convictions respecting every feature of the case.

For the last six years, or more, we have been anxiously, and confidently looking forward to the time when daguerreotypes would be taken in all the brilliancy and beauty of the natural colors. We were not singular in this respect; equally hopeful on this point were many of the first philosophers of Europe, among them Daguerre himself.

In a former article on this subject we gave a brief history of the attempts made by European *savans* to arrive at the consumation of this sublime, deeply interesting, and important point in the Daguerrean art, and expressed the deep and lively interest we felt in all the attempts made for its development. It can not, therefore, appear strange, that we should seize the first *positive* announcement that this great desideratum had been gained, to congratulate the public and our Daguerrean friends. And we were the more elated at the result on account of a natural feeling of national pride. It was not only that the secret was discovered, for this—as we said before—we looked forward to with the utmost confidence, but that the skill of a fellow-countryman had made it, that gave us most pleasure.

We had no reason to doubt Mr. Hill's veracity, and the manner in which he was presenting the fact of his having made the discovery to the Daguerrean artists of the United States would have given us confidence in his assertions, had we positively known him to be wanting in veracity. It is due to him to say that he did not seek for public notoriety in the matter, but that he was quietly presenting the facts of the case to his brother artists personally, or by letter, and that it was not until after the announcement in our first number—which we felt it our duty, as a journalist, to make—having promised in our prospectus to keep our readers advised of every thing new in the art—that Mr. Hill made the fact known to the public over his own signature.

We first heard of the discovery in a very indefinite manner through Mr. Root, of New York, and afterwards was shown a private letter of Mr. Hill's to a distinguished Daguerreotypist of the same city. It was the contents of this letter—which asserted the fact of the discovery in the most positive terms—that induced us to make

the announcement in our January issue, which called forth Mr. Hill's first published letter, to be found in our February number.

It will not be necessary for us to go into detail in regard to the probable causes which should develop the secret of daguerreotyping colors, and upon which we founded our belief in the practicability of producing them, as we have already done so in our March number. We shall therefore confine ourselves, as we have before intimated, to a review of Mr. Hill's statements and course in the matter, and present the views we have arrived at from their tenor.

We find that it is the general impression among Daguerrean artists at the South and West, that the announcement of this discovery is nothing more nor less than a scheme, got up by the author to sell his book, and which being accomplished, the matter will be suffered to fall into oblivion as silently as possible.

Now we have some confidence in human self-esteem, if not in integrity, and we are not one of those who judge a man harshly by his acts until we have proof quite positive that he deserves our censure, and we cannot conceive how it is possible for any man respectably situated in society, and claiming to be honest—not to say pious—so carried away by cupidity, as to practice such a swindle upon any community, as this would be were the surmises of some of our friends correct. Such a swindle would certainly come under the act for obtaining money under false pretences, for false inducements—if no discovery has really been made—have been held out to Daguerreotypists in order to secure the sale of a work, the actual value of which—comparing it with others of a like nature—is not worth the money charged, although we doubt not that very many operators derive assistance from its perusal, worth more to them than its price. But the fact that a large number have been induced, by the representations of Mr. Hill to purchase several copies, in order that he might be enabled the more speedily to bring before them his alleged discovery, would, in the event of his failure to make his representations and assertions good, in fact, brand him as a swindler, and we do not see how he could escape, were any of those from whom he has thus obtained money to prosecute him for it under the act, already alluded to, of this state.

There are very few men—except the professional gambler and pickpocket—who would dare brave such a contingency, even with far less chances of discovery. In a case like the one under discussion it is not relatively merely man to man, but the world is more or less effected by and interested in the affair, and if it be proved to be a conspiracy for self-aggrandizement, it is not an isolated community who will be called upon to punish the offender, but the whole world, and his fall would be so low, that no other act could ever again advance him one step in the estimation of his former friends and abettors.

This we conceive to be a fair view of the risk Mr. Hill has run in asserting his discovery for taking Daguerreotypes in the natural colors, unless he has something more than a passing accidental colored impression.

But we have not Mr. Hill's own assertions in the matter only. We have conversed with his brother, R. H. Hill, and another gentleman, to whom we were introduced, but whose name we have forgotten, who have assured us in the most positive terms that they have seen Mr. Hill's pictures, and that there is no fallacy in his assertions. Others who have visited him at his house in Westkill, have expressed to us their convictions of the truth of his statements, although they have not seen the pictures.

To the question; "why, if Mr. Hill has succeeded in obtaining the colors, does he refuse to exhibit his pictures?" we reply in his own words, "because, when the discovery was first made, he entered into a solemn compact, reduced to writing, with Mrs. Hill, not to do so, and it was only upon the advice of a lawyer, who assured her of its necessity, in order to ensure prior claim in the event of applying for a patent, that she consented to their being shown to her brother, brother-in-law, and the gentleman already mentioned. We think this compact was conceived in a very unwise spirit. It arose from the fear that the exhibition of the pictures would lead to the discovery of the process by some other, and the loss of the benefit to be derived from it. This feeling was very natural, but from

all we can learn, we think unnecessarily indulged. Every man, however, knows his own business, and of this we have no right to complain; we mention it as the only apology that can be made for the persevering determination in Mr. Hill not to show his pictures.

Taking the view of the *morale* of the case as we have now given it, and having the evidences we have adduced before us, we certainly cannot be censured for believing, until we receive most positive proof to the contrary, in the alleged discovery of Mr. Hill.

Although we believe—for the reasons given—in Mr. Hill's having obtained a compound by which he can bring out the colored image upon the Daguerreotype plate, we have not the same confidence in his ability to teach the process to others, and a consciousness of this on his part, we believe, is the true cause for his requiring so much time to perfect his discovery. We may be mistaken, but we arrive at this conclusion from reading and listening to his own statements. This, we think will appear in the sequel.

In Mr. Hill's letter to the Photographic Art-Journal for February, he says:

"Some two years ago I commenced experimenting, with a view to this great desideratum, but with little faith. I started with the theory that circumstances might be created, and certain juxtapositions arranged whereby a *latent colored image* might be imprinted by means of the camera, on a prepared sensitive surface, and that mercury not being the only vapor possessing a *developing power*, some other vapor or substance might be found, which, while it would develop, would preserve the colors of the said latent image. I found a large number of substances which would develop the images in *light and shade*. After almost numberless experiments, in which I produced nothing but *light and shade*, (save in one instance in which the red of a colored dress was brought out,) I was about giving up the pursuit, when I quite unexpectedly formed a *singular compound*, which I applied to the purpose, and succeeded in obtaining *a magnificent picture in colors*. This picture is quite equal to any I have taken since.

"The *compound* above referred to, is, to me, a nondescript, though I have made the science of chemistry my study for years. That it is a new substance, or combination of substances, I am positive, and this is all I know concerning it. It is simply and easily produced, but not by any law stated in the large number of chemical works with which I am familiar. Doubtless, however, a correct and thorough analysis will determine its nature.

"My process bears no resemblance to Becquerel's or Sir John Herschel's, and it is *essentially different* from Daguerre's. I am indebted to much *humbler sources* for my success, as the sequel will show. All is perfectly simple, and a good Daguerreotypist would master the process in one day. That the discovery will completely supersede Daguerreotyping, I have the assurance of many eminent artists. No Daguerreotype ever taken will at all compare with these marvellous pencillings of the colored rays."

It will be perceived that in the first paragraph quoted he says that he "*unexpectedly formed a singular compound*," which he applied to the purpose, bringing out the latent colored image; and in the second paragraph he says, "the compound above referred to, is, *to me, a nondescript.*" "That it is a *new substance, or combination of substances, I am positive, and this is all I know concerning it.*" Now, we can take these words in but one sense. The compound which has enabled him to take the pictures enumerated in his letter, was the result of a mere accident, and not the effect of a studied and careful combination, resulting from his own researches into the phenomena of nature; and that he is entirely ignorant of its component parts, and the method of compounding it. This idea is more firmly impressed upon our mind by the conclusion of the paragraph, where he says, "*doubtless, however, a correct and thorough analysis will determine its nature*;" yet, in the very same paragraph he says that, "*it is simply and easily produced.*"

Here is discrepancy, for how is it possible for a substance to be easily produced, when its component parts are unknown? In order to arrive at the nature of simple substances forming a compound, it is necessary to make a very careful, and often delicate, analysis of that compound, and we

think it no disparagement to his talents to say that if, as we suppose, Mr. Hill has already made several attempts to analyse this compound, and has not succeded, it may be reasonably doubted that he ever will, and the art of taking daguerreotypes in color, must be, for a time, lost, when the compound he now possesses is exhausted.

So delicate is the process of analysis that it is not always possible to arrive at a perfectly correct division of a compound into its component parts, and it is only those who have spent years of toil and study in analytical chemistry, who are competent for the task. Of all the practical chemists in the city of New York, there are but one or two considered capable of overcoming the most intricate compounds. If we remember rightly, one of these was, a year or two back, foiled in his attempts to analyze a compound submitted to him for that purpose.

Under these circumstances, and from these statements of Mr. Hill himself, we arrive at the conclusion that, although there may be no doubt as to the fact of his having succeeded in obtaining daguerreotype pictures in their natural colors, if we are to depend wholly upon him for a successful termination of the process, it will never be accomplished. That in order to accomplish the ability to teach the process to others, he must throw aside his want of faith in the honesty of man and employ some highly respectable chemist—Dr. Chilton, of New York, for instance—to ascertain the nature of the compound. If we are wrong in our judgment we shall be well pleased to be corrected, but until we are convinced by reasons more tangible than any we have had yet given us, we must be suffered to hold to the opinions we now entertain. We make them public because it is our duty as a journalist so to do, and it has been required of us by our readers. To Mr. Hill we tender our warmest sympathies, and assure him that we shall do all we can to further his views in this matter, so far as we can in strict justice to the public, but we are unwilling that a large number of persons should be injured for the special benefit of one. It is therefore necessary that we should recommend the public not to be too sanguine on this subject of obtaining pictures in color, for we consider that the slightest accident might deprive Mr. Hill of the power to render his discovery permanent, and years may transpire before it is again made.

Again, Mr, Hill says: "I have several portraits, in which I have the *true complexion of the skin, the rosy cheek and lips*," &c., while further on—"*the yellow rays do not comport with the other rays—the yellow appearing a buff.*" Now, all who know anything about the true *color of the skin* must be aware that yellow is the prevailing tone to all complexions. It is modified or predominent according to the climate in which we live, or to the peculiar temperament of individuals. This fact precludes the possibility of obtaining the *true* complexion of the skin, if it be not possible to obtain the positive tone of yellow, existing in the face, before the camera.

Red, the next most predominent color in the human body, is also classed as the second colored ray possessing a partial non-photogenic effect, and most difficult to impress upon the daguerreotype plate. We thus see that these colors must necessarily be more slow in impressing themselves than the deeper colors—such as indigo, blue, and their compounds, and that consequently, there must arrive difficulties in obtaining perfect images of some of the colors in the process necessary to produce them. Yet we doubt not that these difficulties, may be overcome, and we do not consider that these facts disprove the possibility of obtaining the colors on the daguerreotype plate; they simply show a want of unity in the several parts of the communication under review. Yet we do not think that these discrepencies are so much the result of a desire to state too much, as to the want of sufficient knowledge and "experience in this branch of operating."

This is another reason why we think, that, if we are to depend entirely upon Mr. Hill's skill for a full development of the process, we shall either never see it perfected, or many months must elapse before it is so, and it is folly to suppose that there are none among our most celebrated chemists worthy to be trusted with the secret, and called in to assist in perfecting the discovery. We must confess that this course would shake our belief in the discovery, had we not the reasons, substantially given, for thinking otherwise, and

we do not wonder at the effect produced upon the minds of the majority of our Daguerrean artists, by this suspicious trait in the character of the discoverer. A man who is himself devoid of all confidence in his fellow men, must expect to find those, and many of them, to suspect his own sincerity.

In regard to the opinion that this announcement is simply a scheme for selling a large number of Mr. Hill's books, we will say, that we were fearful that this plan for sustaining himself would lead to opinions unfavorable to him, but we really do not see, how, under the circumstances, he could do otherwise. Mr. Hill is a poor man, and, knowing this, quite a number of interested men were most pertinaciously besieging him with offers of pecuniary assistance, on terms that would have made the discovery a monopoly of the very worst form. The most cunning acts of designing men were practised in order to entrap him, unconsciously, into agreements that would give these men a hold upon a portion of the interest in the discovery; but Mr. Hill evaded them, and at last resolved upon issuing a third edition of his book, to relieve his embarrassment in order that he might be perfectly free to carry out his determination not to make it a monopoly, but to give all, equally, an opportunity to be benefitted by it.

In this he appears to have changed his mind, for we do not think that his plans, as announced in his book, for disposing of the secret, at all in accordance with his verbal declaration to us. We think he acted unwisely in issuing his book for the purpose avowed—although at the time this determination was made known to our Daguerreotypists, we could not see how he could do otherwise, for a contingency arose which made it quite unnecessary, as it would have relieved him of his embarrassment entirely, and enabled him to give his discovery to the world on the braodest democratic principles, which principles he professes to hold in the highest veneration.

It will be remembered that we have repeatedly hinted at an offer made to him by a gentleman, whose ability to fulfill whatever he promises is undoubted—and the disinterestedness and liberality of which must elevate him still higher in the estimation of the public—and our advice as to its acceptance. This offer we have now the liberty of making public, with the assurance that any reasonable demand will be complied with. Mr. Hill is not restricted, nor obliged to perfect the process. All that is required is to make the secret, so far as he has gone, public, leaving all improvements, of which it is capable, to be made by others. This offer is contained in the following letter, addressed to Mr. Hill by Mr. Anthony.

"*New York*, Feb., 13, 1851.

"DEAR SIR:—Mr. Snelling has had the kindness to show me your communication for the Photographic Art-Journal, announcing the important discovery by you of a method of taking Daguerreotypes with all the natural colors.

"Nothing has given me greater pleasure than this announcement, and I am anxious that so valuable an improvement should be given to the world at the earliest practicable moment.

"A patent would give you no security, and entail endless vexations. Moreover, about such a discovery there should be no exclusiveness. I take the liberty therefore, of making the following suggestions.

"You deserve a liberal reward for a discovery so perfect as your article describes it to be. Make up your mind what sum of money would be a fair equivalent, so that you could freely give the benefit of it to the whole world.

"Let a subscription list be started, to which all who are interested in the progress of the art, shall be invited to contribute, until the amount is made up. The lists to be kept by some respectable party in each of the principle cities, and the main list at some place as head quarters; no money to be paid over until all is subscribed, and until certain gentlemen selected as judges—say Draper, Morse, &c., shall pronounce the discovery true, and in all its parts as represented, both as respects the simplicity of operation and the perfection of the results.

"Though not at present a Daguerreotypist, I will be happy to head the list with a subscription of one hundred dollars, and I think there is spirit enough among those connected with the art, and among the admirers of art in general, to give you a suitable reward. I have written this hastily

and have not attempted to perfect the details of the plan.

"Let me know how the idea strikes you, and I will be happy if you think well of it, to render you every assistance to carry it out successfully.

"I remain, &c.,
E. ANTHONY.

"REV. L. L. HILL.
Westkill, N. Y."

To this letter the following reply was given:

Westkill, Greene Co., N. Y.
March 28th, 1851.

"MR. E. ANTHONY:—As I promised to write to you I will embrace the present opportunity to do so. Since arriving home I have been very unwell—my old bronchial difficulty, excited by a severe cold. I have not done a days' work, and it has been a sore affliction to me. I am now some better, and hope to resume my wonted labors in a day or two.

"It has been a question with me—How shall I get through? I am a poor man, and must have the means of supporting my family, without embarrassment, or I cannot work. In New York offers of money were made me—I have received the same from other sources—but what I have been all along fearful to do, I am now fully resolved not to do, viz: to receive advances on a process, in the disposition of which I *will* act independent. What, under such circumstances, could I do, less than help myself in my usual way. After much deliberation, therefore, and seeing no other way short of *committing myself*, I am about getting up another book. It will embrace my old work abbreviated, and some additional matter, introductory to the new process. You will be furnished with a circular, which will more fully explain matters, and I hope for your co-operation in the sale of the work.

"The bearer of this is Rev. Stephen Jones, pastor of our church, who has kindly volunteered to aid me for a short time. I wish to make all my sales at once, that I may be free to go on with my experiments. All I require is health, and sufficient means, to make me feel easy, and I have no fears for the result. My difficulties are slight, and I am perfectly sure of overcoming all.

"Any aid you may render Mr. Jones will be duly appreciated.

"Truly yours,
L. L. HILL."

It will be perceived that no direct answer is given in this letter to Mr. Anthony's proposition, and from its tenor any one reading it without having previously seen Mr. Anthony's, would conclude that his offer was like all the others which Mr. Hill has asserted have been made. It can be seen, however, that there is not the slightest analogy between them. The first is based upon the principle of "THE GREATEST AMOUNT OF GOOD TO THE GREATEST NUMBER," while the latter are purely selfish, and made for the purpose of enriching two or three individuals, at the expense of the most respectable and successful of our Daguerrean artists.

But we have nothing to do with these men in the matter, if Mr. Hill perseveres in his laudable determination to act perfectly free and independent, reserving to himself the exclusive right to dispose of his secret.*

Let us for a moment suppose that Mr. Hill does dispose of a share or two in the secret, and review the consequences.

* We have now every reason to believe that he will strictly adhere to his resolution. Facts have come to our knowledge since this article was in type, which gives us renewed confidence in his firmness. It will be seen by a letter from Prof. Morse, which we append, that Mr. Hill entertains sentiments of liberality far above what the most penurious could reasonably expect. We consider it more than generous—it is noble.

There is not a Daguerreotypist with whom we have conversed who cannot bear witness to our unwavering belief in this great discovery, and none can doubt the motives which actuate our remarks in regard to its disposition among our artists, and we repeat our assurance to Mr. Hill, that we desire to do nothing that will in the least trammell his efforts to bring it speedily before the public.

We are led to these remarks by a supposition expressed by a friend of Mr. Hill, that our remarks in the May number were intended to be hostile to his interests. Nothing is farther from our minds. The rumors which we quote are such as to do Mr. Hill great injury, and we only give them greater publicity in order that their correction may be as widely disseminated as possible. For this course we have the authority of Mr. Hill himself, in a letter addressed to us in February last. We will write more on this subject in our Gossip.

What has been the course of the different improvements and inventions in the Daguerrean art in this country ? The history of the most recent—the "*accelerating, or magic buff*"—gives the answer. Mr. Hill's discovery, must, from natural necessity take the same. At first, mans' cupidity will tempt him to charge an enormous premium for the secret, and as the market of *respectable* Daguerreotypists becomes glutted, the next *most respectable* will be furnished at *lower rates ;* then will come the *third class*, with a *further reduction in price*, and finally, when this source is exhausted, it will be as cheap a commodity as the present process. We do not see how Mr. Hill is to avoid this result, even if he retains the exclusive right to his discovery. It is said that he intends to bind all to whom he sells not to take pictures for less than three dollars. This will do very well at first, but it will never be carried out to the end ; the laws of trade will oppose it ; the innovations of improvement will prevent it.

Patenting the process will be no protection, as hundreds of instances have already proved ; and why ?

Because, the fact that the process for producing the colored pictures is confined to a substance to be used for bringing them out instead of mercury, is generally known, and certain modifications of this substance may be produced which will vitiate a patent, or involve the patentee—like Prof. Morse—in ruinous law suits. When any one of these modifications is discovered there is an end to exclusiveness. Even if these modified discoveries are not made, there is a possibility of the process being obtained in some underhand manner, and practiced with impunity, for there is no law that will oblige a man to commit himself, and unless evidence can be obtained that the process used is an infringement of the patent, damages cannot be given by a jury, nor an injunction put upon the operator. The *presumptive* evidence may be of the strongest kind, yet it will not avail ; in patent cases it requires the most direct and positive proof in order to sustain an alleged infringement.

Again, we will suppose an operator actually proved a pirate of the process, and an injunction put upon his proceedings in the city of New York, which would be effected at great cost, the injunction would be evaded, undoubtedly, by his removal to another state, so that the patentee would again be subjected to similar costs. So may it go on *ad infinitum*.

All these are considerations which would influence us materially in disposing of such an invention, and lead us to accept such an offer as we advocate, were we the discoverer.

Mr. Anthony has permitted us to publish the following letter, by which it will be perceived that Mr. Hill still adheres to his first resolutions, neither to show his pictures, or allow a monopoly to be made of his discovery. The price mentioned, if fixed upon, will, unquestionably, satisfy all —at all events, those who are not so ought to retire from the business. For our part we think it too small.

"*Po'keepsie*, May 29, 1851.

"My Dear 'Son in the Art :'

"Yours of the 27th inst. I have this moment received, and in reply would say that I visited Mr. Hill some days since, and was much gratified with my visit, although you are misinformed in regard to my having seen his results. From my conversations with him, however, *I have no doubt whatever of the reality of his discovery.* There are good reasons why he should at present withhold both his process and his results from the public, and one is the prevention of any undue advantage being taken (by capitalists or others,) of those who are engaged in the Daguerreotype Art. Mr. Hill I found to be a man of enlarged and liberal views in this respect. Fully aware of the important bearing of his discovery on the pecuniary interests of the profession, he is desirous to fix such a price upon his process as shall give to all an equal chance, while he secures of course, a proper and just compensation for himself. In my correspondence with him, I am endeavoring to aid him in accomplishing these desirable ends.

"My own views are these. I see that by Mr. Hill's discovery, a *second volume* is added to Daguerre's *first volume* of Photography. The sett is now incomplete without this *second volume.* No Daguerreotypist can be without it, and with it his Art is perfected. Is there one who cannot afford, say *one hundred dollars*, for a detailed account of the process, provided it was assured to him in truth? Tell me

what you think would be the feeling of the mass of the profession in regard to that price. I think it moderate. For there is not a Daguerreotypist, who, with the process in the first days of its novelty, could not, by a slight addition to the present prices of a daguerreotype, refund to his pocket, in two weeks, what he shall have paid for the secret of the process.

"I have no personal interest in the matter, except the gratification I shall take in so aiding Mr. Hill, and the profession, whose interests are vitally affected by the discovery, that both he and they shall be mutually benefitted, while the burden of the tax shall fall where it should, on the public, who eventually possess the results of both. It is right that Mr. Hill should be liberally compensated, and it is right that the profession, by whose skill and practice Mr. Hill's discovery is exhibited to the public, should also be compensated, and it is right that they who *possess the results* of the perfected art, should *pay for them.*

"I have not time to add more. Truly your friend and serv't as ever.

"Saml. F. B. Morse.

"E. Anthony, Esq.,
205 Broadway."

To this Mr. Anthony replied.

"*New York*, May 31, 1851.

"My Dear Sir:—Your favor of 29th, came to hand this day. Your declaration of your conviction of the reality of Mr. Hill's discovery will be a source of satisfaction to very many who are still 'afraid to believe.'

"I am also well pleased to have your testimony with regard to Mr. Hill's enlarged and liberal views. If he can succeed in carrying them out, and I do not see why he cannot, it will add as much to his glory as the discovery itself.

"There should be no middle-men to interpose between Mr. Hill and the Daguerreotypists, to levy a tax upon the profession.

"The price you mention for a participation in the benefits of the discovery, I think to be a moderate one, and at the same time, one likely to yield a better compensation to Mr. Hill than any other. I think every permanently located artist would be willing to pay it, and in fact would have to do so to preserve his reputation with his townsmen, who would know through the press that this important improvement could be obtained by him for so comparatively trifling a sum.

"I am glad that you are in correspondence with Mr. Hill on the subject. I feel that your united counsels will 'devise liberal things,' and that the true interests of Daguerreotypists will be properly cared for.

"I have only to add that if I can be of any assistance in carrying out the details of such plan as Mr. Hill and yourself may decide upon as most advantageous, my best efforts are at your service.

"I remain, my dear sir, with sincere respect, your friend. E. Anthony.

"Prof. S. F. B. Morse,
Po'keepsie."

The Carbon Battery.—A series of Bunsen's battery has been lately exhibited at the Adelaide Gallery, consisting of 80 cells. We were present at a private exhibition, but saw nothing in it to induce a belief that carbon will ever be practically valuable as a substitute for platinum in Grove's arrangement. The power did not nearly equal that of similar series, arranged in the usual way. The essential mechanical adjustment of metal connections, b-tween the consecutive zinc and carbon cylinders caused great local action, and reduction of power. After all, it is only a matter of original outlay, which is returned when the battery is no longer needed—*Electrical Magazine.*

TREATISE ON PHOTOGRAPHY;

Containing the latest Discoveries and Improvements appertaining to the Daguerreotype.

BY N. P. LEREBOURS, *Optician to the Observatory, Paris, etc., etc.*
TRANSLATED BY J. EGERTON;

WITH A PREFACE, NOTES AND ALTERATIONS, BY H. H. SNELLING.

CHAPTER XX.

On the Reproduction of the Proofs by the Electrotype.

THE first impressions reproduced by the electrotype were obtained by Mr. H. Fizeau; and we may say, that these first essays have not been since surpassed, for the large plates that he produced were admirable.

We imagine that many amateurs, when informed of the extreme facility with which they can now operate, by means of the new batteries invented by Bunsen, will devote themselves to this species of reproduction, which gives such fine results. We must confine ourselves here to pointing out to them the minute precautions which are necessary to avoid spoiling the original plate and its copy. Two apparatus are necessary to obtain a reproduction: 1st, One of Bunsen's cells; 2nd, A glass precipitating-trough, to contain a saturated solution of sulphate of copper.*

The plate must first be entirely divested of all traces of hyposulphite, and it is *indispensable* that it should be perfectly fixed by the chloride of gold.

In general, operators are in a hurry to see the progress of the process. We advise them to moderate that eagerness which is frequently the cause of failure. They should always wait a few minutes before taking the plate out of the bath; and, each time that it is done, care must be taken not to leave it long in contact with the air, as a few minutes would suffice to oxydize the surface to such a degree as to hinder the next deposit from adhering to the first.

When the metallic coating is judged to be of sufficient thickness—and, in this case, that of a stout card suffices—the plate should be rinsed copiously in water, and then dried either with saw-dust or blotting-paper. If you wish to preserve on the plate the beautiful rosy hue of the mother-of-pearl opal, which the deposit should leave on its being taken out of the bath, hasten the drying of it, after passing it once through the water, by wetting it with spirits of wine, which you also dry up with blotting-paper.

The separation of the deposit from the plate may be attended with an accident which spoils them both. It often happens that a small drop of liquid remains unperceived under the wax which covers the borders of the plate, and that, at the instant when you lift up the deposit with the blade of a knife, this drop works itself into the capillary space thus formed, and wets the deposit and the plate, which are infallibly stained if the liquid contains any remaining particles of the sulphate of copper.

The most secure process for separating the two plates consists, when the deposit is not too thick, in cutting with a pair of strong scissors a band of about two millimetres in width all round the two plates, which then separate with the greatest facility.

The affinity of oxygen for copper being much greater than for silver, the counter-proof must be withdrawn as soon as possible from the contact of the air, by placing it in a skeleton frame; and, above all, the greatest care must be taken not to touch its surface with anything whatsoever. It is, moreover, necessary to observe the nicest precaution in preventing all dust or other foreign substances from lodging on the surface of the plate, otherwise the copy would be found disfigured with their corresponding traces.

Having thus explained the most essential conditions to be observed, we will now enter into some further details of the operation. Lay hold of the silvered plate by one of its sides, or, if a small plate, by one of its angles, and keep that part free from oxidation, in order to attach it to the con-

* The electrotype of Boquillon may also be used; but only for the plates of the 1-6th size.

necting wire of the trough, to which the positive pole (zinc) of the battery is joined, and the whole is held fast with a binding-screw.

The back of the plate is then covered with a coating of varnish, composed of one-third of essence of turpentine and two-thirds of beeswax, or simply of beeswax alone, in order to avoid a useless deposit of copper. Care must be taken that this coating of varnish, which should be applied hot, should be of a certain thickness, and should not interpose between the plate and the connecting wire of the precipitating trough, or it would interrupt the metallic contact necessary to the success of the operation.

The sulphate of copper solution must be carefully filtered, and it must be saturated in cold water.*

When all is prepared, put the positive electrode (a copper plate, which dissolves in the trough) in connexion with the negative pole of the battery (carbon), and immerse it in the bath; establish also a connexion between the proof to be reproduced and the other pole (zinc), and when firmly attached by means of one or more binding-screws, it must be immersed in the bath, when it will immediately become covered with copper.

A single battery of Bunsen charged outside with pure nitric acid, and with a mixture composed of one part of sulphuric acid and fifty parts of water in the interior of the porous vessels will suffice to reproduce, in the space of a few hours, a large plate of 16 centimetres by 0.22. The expense consists, therefore, only in the value of the copper deposited; and when it is considered that, with so very small an outlay, you may be able, after one or two experiments, to reproduce and multiply, without any risk of failure, the finest photographic impressions (which are always very much prized), with a very warm tone, and an admirable degree of perfection; when you reflect that the same small apparatus may serve for a number of other applications, one is really surprised that it should not be more generally adopted.†

The new processes employed for superposing one metal on another must excite in the highest degree the attention of all those who take an interest in the industrial arts. What a valuable discovery is not that which enables us to apply, in the most simple and economical manner, gold upon steel, copper, and silver—the latter metal upon tin and iron—platina upon copper, bronze, &c.!

Most of these applications will create new arts: it is not our province to enter upon that subject here. However, as a very fine tone may be given to the Daguerrean impressions by gilding, I will inform the reader how I applied this process so as to produce the *first gilt photogenic image* attempted by this art.

In the month of August, 1841, being at the time unacquainted with Messrs. Ruolz and Elkington's patents for their new gilding processes, but anxious to know how the admirable chloride of gold, which we owe to Mr. Fizeau, would act in a cold process, I placed a Daguerrean impression in an electrotype; and, to my great surprise and delight, I found, at the end of a quarter of an hour, that it had acquired a superb gold tone! As may be easily imagined, I immediately showed this result to Mr. Boquillon; and, having expressed to that gentleman a wish to submit it on the following Monday to the Institute, he led me to infer that this result, confirming as it did certain theoretic laws, some important applications of which he was then testing by various experiments, was peculiarly interesting to him. This was suffi-

* In order to have a solution always ready, it will be well to keep it in a large glass-bottle; it will be known that it is sufficiently saturated, when after having shaken it several times, the liquid ceases to dissolve the few crystals of sulphate of copper which remain at the bottom in excess.

† The *reproduction* in copper or silver, whether polished or dead, of a medal, seal, or cameo, &c., are operations which cannot fail to be agreeable to most persons in easy circumstances; as it enables them to obtain, at a merely nominal price, an object of art which has often a great value, it being, at the same time, a pleasing occupation, which diverts the mind during the intervals between more serious studies. Plaster-casts, fruits, insects, and certain flowers, may also be *covered over* with copper, by this process, and afterwards gilt or plated.

We hope these instructions will suffice to reproduce the Daguerrean images; but those who would wish to make a particular study of the laws by which metallic precipitations are produced, must procure the complete Treatise on the Electrotype by Mr. L. . . , sold by N. P. Lerebours, 13, Place du Pont-Neuf, Paris.

cient to induce me to withhold my intended communication to the Institute; and I accordingly confined myself to addressing a letter to Mr. Arago, with a specimen, merely to fix the date of my discovery.* Since then, I have made various experiments with different salts of gold. The only one which succeeded, with the electrotype, was Mr. Fizeau's mixture (the chloride of gold and the hyposulphite of soda). It is doubtless to the energetic action of this solution, that this astonishing result must be attributed; for, whether with Smee's battery or Bunsen's element, the gilding I obtained with this same salt, did not give me a superior result; and yet the double cyanides used with the last apparatus gave a much richer tone than the chloride of gold; but with the electrotype, I repeat it, the chloride of gold alone gave me excellent results.

To operate with the electrotype, the following is the method of manipulating: instead of the sulphate of copper, pour in Mr. Fizeau's solution, and very slightly acidulate the liquid in which the zinc is immersed; a few minutes will suffice for this operation, which must be attentively watched, often examining the formation of the coating of gold deposited; for, if the operation were too much prolonged, the thickness of that coating would successively efface all the half-tints, and would consequently destroy the beauty of the impression.

With the decomposing trough, and Bunsen's or any other battery, you must operate exactly as with a sulphate of copper bath. If you wish to maintain the gold solution in a saturated state, immerse in it, at a certain distance from the plate, a thin sheet of gold, which must be connected with the negative pole. If otherwise, you have merely to immerse in the bath a platina wire, which must be moved about in it, and, when the action is rapid, at a distance from the plate.

A deposit of copper upon the plate thus gilt may be obtained; but this counterproof will naturally be less vigorous, because this layer of gold, however thin it may be, always weakens a little the extremely delicate details of the Daguerrean image.

* A short time after he made his communication to the Institute, Mr. De Ruolz was good enough to gild several plates for me; these impressions were of a very fine gold tone, rather dark, and inclined to red.

CHAPTER XXI.

On Engraving.

The idea of transforming the Daguerrean images obtained on the silvered plates into engraved plates, so as to multiply them by impression, must have struck a great number of persons: we can affirm that it is Mr. Donne who was the first to obtain a somewhat satisfactory result. The following is the manner in which he operated:*—

After having gone through the washing process in the ordinary way, taking care to use a rather weak solution, the plate, which should be faultless, and containing at least one-twentieth of silver, should be dried, and its edges beyond the image covered with a coating of engravers varnish.

Place the plate horizontally over a pan, on which its four angles rest, and pour upon it, in such a manner as to cover all the unvarnished parts, a rather thin liquid coating, being a solution containing three parts of *pure* nitric acid and four parts of water.

At the end of three or four minutes, small globules will begin to appear at different points, and will at last spread over

* Mr. Fizeau, so well known for his admirable discoveries in photography, has just found out a process for engraving the Daguerrean plates, which is very superior to any hitherto known. We have seen some of the proofs struck off, without any particular care, by a workman of ordinary ability, and we can affirm that the most of these engravings, when seen through a magnifying-glass, showed the exact representation of the Daguerrean image, with its most minute details. Moreover, in the proofs which have been submitted to our examination, the dark parts of the picture were reproduced with a great degree of vigor, and, what is very remarkable, the white parts of the paper were perfectly pure. When one reflects on the future results of this discovery, one cannot be surprised that Mr. Fizeau should have wished to keep it secret. For our own part, it would be of immense utility to us for the publication of the *Daguerrean Excursions;* for, with its aid, we might immediately reproduce, at very small expense, the remarkable views which our correspondents are continually sending us; and, in order to avoid any greater or lesser alteration in the press, we should immediately reproduce several plates by the electrotype.

all the parts of the plate. It is here that the greatest difficulty presents itself, for, nothing but experience can point out the moment at which the plate is sufficiently acted upon by the acid. If you cease the operation too soon, the blacks will be without vigor and of a gray tone; if prolonged beyond the necessary time, even the whites will be affected; thus the operator has two difficulties to contend with. Mr. Donne has pointed out an ingenious method of solving these difficulties, which he has found frequently to succeed; it consits in blowing off the acid with the breath from all the white parts, in order to preserve them. This method is doubtless very good, but can only be used when the lights are accumulated on one point, which is very seldom the case.

Dr. J. Berres has given a process for etching, which has much analogy to that of Mr. Donne, from which it only differs in this, that Mr. Donne operates with a mixture of nitric acid, whilst Dr. Berres begins by exposing the plate to the vapors of nitric acid, slightly heated, and after having covered over with varnish those parts which are to be protected, he covers the plate with a coating of gum arabic, which he afterwards melts in nitric acid at a strength of twelve or thirteen degrees, and which he augments progressively to sixteen or eighteen degrees. When the vapors are manifested, the plate is engraved.

This process, which we have never practised, appears to us to require a certain skillfulness in protecting the white parts and covering them with varnish, and in seizing the moment at which the plate is sufficiently eaten into by the acid; but we think that none but an engraver can expect to succeed in it.

CHAPTER XXII.

On a Voltaic Process for Etching Daguerreotype Plates. BY W. R. GROVE, ESQ., M. A., F. R. S., *Professor of Experimental Philosophy in the London Institution.*

DR. BERRES, of Vienna, was the first, I believe, who published a process for etching daguerreotypes. His method was to cover the plates with a solution of gum-arabic, and then to immerse them in nitric acid of a certain strength. I have not seen any plates thus prepared, but the few experiments which I have made with nitric acid have given me a burred and imperfect outline: and I have experienced extreme difficulty of manipulation from the circumstance of the acid never attacking the plate uniformly and simultaneously. My object, however, in this communication, is not to find fault with a process which I have never perhaps fairly tried or seen tried by experienced hands, and the inventor of which deserves the gratitude of all interested in physical science; but to make public another, which possesses the advantage of extreme simplicity, which any one, however unskilled in chemical manipulation, may practise with success, and which produces a perfect etching of the original image; so much so, that a plate thus etched can scarcely be distinguished from an actual daguerreotype, preserving all the microscopic delicacy of the finest parts of the impression.

One sentence will convey the secret of this process; it is to make the daguerreotype the *anode** of a voltaic combination, in a solution which will not of itself attack either silver or mercury, but of which, when electrolysed, the anion will attack these medals unequally. This idea occurred to me soon after the publication of Daguerre's process; but, being then in the country, and unable to procure any plates, I allowed the matter to sleep; and other occupations prevented for some time any recurrence to it. Recently having heard much conversation as to the practicability or impracticability of daguerreotype engraving, I became anxious to try a few experiments in pursuance of my original notion; and for this purpose applied in several quarters for daguerreotypes; but, thanks to the exclusiveness of M. Daguerre's patent, I found that to procure a sufficient number of plates for any reasonable chance of success was quite out of the question.

On mentioning the subject to Mr. Gassiot, he, with his usual energy and liberality, offered to procure me a sufficiency of

* Strictly speaking, this is a misapplication of Faraday's term; he applied it to the surface of the electrolyte. As, however, all Continental and many English writers (among whom I may name Whewell) have applied it to the positive electrode, and as an expression is most needed for that, I have not hesitated so to apply it.

daguerreotypes; and it is owing to his zealous and valuable co-operation that I have been able to get such definite results as appear worth publication.

Five points naturally present themselves to the consideration of the experimenter on this subject:—first, the quantity of the voltaic current; secondly, its intensity; thirdly, the distance between the anode and cathode; fourthly, the time during which the process should be continued; and fifthly, the solution to be employed.

1st. With regard to the first element, uantity, many previous experiments had convinced me, that to give the maximum and most uniform quantitative* action of any voltaic combination, the electrodes should be of the same size as the generating plates; in other words, that the sectional area of the electrolyte should be the same throughout the whole voltaic circuit. It seems strange that this point should have been so generally overlooked as it has been: an electrician would never form a battery, one pair of plates of which were smaller than the rest; and yet the electrodes, which offering of themselves a resistance to the current, from the inoxidability of the anode, are, *a fortiori*, a restriction when of small size, have generally been formed indefinitely smaller than the generating plates; I, therefore, without further experiment, applied this principle to the process about to be detailed.

2nd. *The intensity of the voltaic current.*—Here it appeared to me, that, as in the electrotype, where the visible action is at the cathode, a certain degree of intensity throws down metal as a crystal, an increased intensity as a metallic plate, and a further intensity as a pulverulent mass; that degree of intensity which would show on the negative deposit the finest impressions from the cathode, would also produce on the anode the most delicate excavations, and consequently an intensity which would just fall short of the point of evolving oxygen from the plate to be etched, would be the most likely to succeed. This point was not, however, adopted without careful experiment, the more so, as in one instance Mr. Gassiot succeeded in procuring a very fair etching with a series of ten pairs of the nitric acid battery; however, the results of repeated experiments, in which the intensity has been varied from a series of sixteen pairs to one of the nitric acid battery, were strongly in favor of the above idea, and consequently went to prove that one pair gives the most efficient degree of intensity for the purpose required.

3rd. *The distance between the plates.*—As it was proved by De la Rive, that in an electrolytic solution, when the electrodes are at a distance, the action extends a little beyond the parallel lines which would join the bounds of the electrodes, and thus, that the current as it were diverges and converges, it appeared advisable to approximate the electrodes as nearly as possible, so as to produce uniformity of action over the whole plate. Provided a solution be used which does not evolve gas at the cathode, I am inclined to think that the plates may be with advantage indefinitely approximated; but as this was not the case with the solution I selected for the greater number of experiments, 0·2 of an inch was fixed on as the distance, in order that the gas evolved from the cathode should not adhere to the anode, and thus interfere with the action.

4. *Time of continuing the operation.*—This was a matter only to be decided by experiment, and must vary for the voltaic combination and solution employed. With a single pair of the nitric acid battery, from twenty-five to thirty seconds was, after a great number of experiments, fixed on as the proper time; and as the plate may at any period be removed from the solution and examined, the first experiment should never exceed twenty-five seconds, when, if not complete, the plate may be again subjected to electrolysis.

5. *The solution to be employed.*—Here a vast field was open, and still is open to future experimentalists. Admitting the usual explanation of the daguerreotype, which supposes the light parts to be mercury, and the dark silver, the object was to procure a solution which would attack one of these, and leave the other untouched. If one could be found to attack the silver and not the mercury, so much the better; as this would give a positive engraving, or one with the lights and shadows, as in na-

* I say quantitative action; for, where great intensity is required, as in decomposing alkalis, &c., it may be advisable to narrow the electrodes, so as to present a smaller surface for the reaction of the liberated elements.

ture; while the converse would give a negative one. Unfortunately, silver and mercury are nearly allied in their electrical relations. I made several experiments with pure silver and mercury, used as the anode of a voltaic combination; but found, that any solution which would act on one, acted also on the other. All then that could be expected, was a difference of action. With the daguerreotype plates I have used the following:—

Dilute sulphuric acid, dilute hydrochloric acid, solution of sulphate of copper, of potash, and of acetate of lead. The object of using acetate of lead, was the following:—With this solution, peroxide of lead is precipitated upon the anode; and, this substance being insoluble in nitric acid, it was hoped that the pure silver parts of the plate, being more closely invested with a stratum of peroxide than the mercurialised portions, these latter would, when immersed in this menstruum, be attacked, and thus furnish a negative etching. I was also not altogether without hopes of some curious effects, from the color of the thin films thus thrown down; here, however, I was disappointed: the colors succeeded each other much as in the steel plate used for the metallochrome; but with inferior lustre. On immersion in nitric acid of different degrees of dilution, the plates were unequally attacked, and the etching burred and imperfect. Of the other solutions, hydrochloric acid was, after many experiments, fixed on as decidedly the best: indeed, this I expected, from the strong affinity of chlorine for silver.

I will now describe the manipulation which has been employed by Mr. Gassiot and myself, in the laboratory of the London Institution, with very uniform success. A wooden frame is prepared, having two grooves at 0·2 of an inch distance, into which can be slid the plate to be etched, and a plate of platinum of the same size. To ensure a ready and equable evolution of hydrogen, this latter is platinised after Mr. Smee's method; for, if the hydrogen adhere to any part of the cathode, the opposite portions of the anode are proportionally less acted on. The back and edges of the daguerreotype are varnished with a solution of shellac, which is scraped off one edge to admit of metallic connection being established. The wooden frame with its two plates, is now fitted into a vessel of glass or porcelain, filled with a solution of two measures hydrochloric acid, and one distilled water (sp. gr. 1·1); and two stout platinum wires, proceeding from a single pair of the nitric acid battery, are made to touch the edges of the plates, while the assistant counts the time; this, as before stated, should not exceed thirty seconds. When the plate is removed from the acid, it should be well rinsed with distilled water; and will now (if the metal be homogeneous) present a beautiful sienna-colored drawing of the original design, produced by a film of the oxychloride formed;—it is then placed in an open dish containing a very weak solution of ammonia, and the surface gently rubbed with very soft cotton, until all the deposit is dissolved; as soon as this is effected, it should be instantly removed, plunged into distilled water, and carefully dried. The process is now complete, and a perfect etching of the original design will be observed; this, when printed from, gives a positive picture, or one which has its lights and shadows as in nature; and which is, in this respect, more correct than the original daguerreotype, as the sides are not inverted; printing can therefore be directly read, and in portraits thus taken, the right and left sides of the face are in their proper position. There is, however, *ex necessitate rei*, this difficulty, with respect to prints from daguerreotypes,—if the plates be etched to a depth sufficient to produce a very distinct impression, some of the finer lines of the original must inevitably run into each other, and thus the chief beauty of these exquisite images be destroyed. If, on the other hand, the process be only continued long enough to leave an exact etching of the original design, which can be done to the minutest perfection, the very cleaning of the plate by the printer destroys its beauty; and, the molecules of the printing ink being larger than the depths of the etchings, an imperfect impression is produced. For this reason, it appeared to me, that at present, the most important part of this process is the means it offers of multipying indefinitely daguerreotypes, by means of the electrotype. An ordinary daguerreotype, it is known, will, when electrotyped, leave a faint impression; but in so doing

it is entirely destroyed; and this impression cannot be perpetuated; but one thus etched at the voltaic anode, will admit of any number of copies being taken from it. To give an idea of the perfect accuracy of these, I may mention, that in one I have taken, on which is a sign-board measuring on the electrotype plate 0·1 by 0·06 of an inch, five lines of inscription can, with the microscope, be distinctly read. The great advantages of the voltaic over the chemical process of etching, appear to me to be the following:—

1. By the former, an indefinite variety of menstrua may be used; thus, solutions of acids, alkalies, salts, more especially the haloid class, sulphurets, cyanurets, in fact, any element which may be evolved by electrolysis, may be made to act upon the plate.

2. The action is generalised; and local voltaic currents are avoided.

3. The time of operation can be accurately determined; and any required depth of etching produced.

4. The process can be stopped at any period, and again renewed if desirable.

The time I have given is calculated for experiments made with one pair of the nitric acid battery; it is, however, by no means necessary that this be employed, as probably any other form of voltaic combination may be efficient. It would seem more advisable to employ a diaphragm battery, or one which produces a constant current, as otherwise the time cannot be accurately determined. It is very necessary that the silver of plates subjected to this process be homogeneous. Striæ, imperceptible in the original daguerreotype, are instantly brought out by the action of the nascent anion; probably silver, formed by voltaic precipitation, would be found the most advantageous. I transmit with this paper some specimens of the prints of the etched plates, and of electrotypes taken from them; and in conclusion, would call attention to the remarkable instance which these offer, of the effects of the imponderable upon the ponderable: thus, instead of a plate being inscribed, as "drawn by Landseer, and engraved by Cousins," it would be "drawn by Light, and engraved by Electricity!"

[With this communication were sent plates etched by the process detailed in the text; electrotype copies from the same; and a considerable number of prints obtained from the former.]

Postscript by the Author.—Few of the readers of the Philosophical Magazine will have an opportunity of seeing any specimens of the process, and as the etching is not deep enough to produce impressions sufficient to accompany the paper, I may give an idea of them by saying that in the print of a portrait which I have now before me, the whole expression of the features is distinct, the pupil of the eye and the speck of light upon it clearly defined, the gloss of the hair and of the satin stock very accurate. The microscopic details alone appear incapable of transference to *paper*, but these, as stated above, being *absolutely perfect* upon the etched plate, I had intended to have directed some experiments to the substitution of more delicate materials than paper and printing-ink for receiving the impressions; incessant occupations have prevented me, and will I fear for some time.

I would suggest the employment of hyposulphite of soda instead of ammonia to remove the oxychloride.—W. R. G.

CHAPTER XXIII.

Photogenic Papers.—On the Calotype.

BY H. F. TALBOT, ESQ., F. R. S.*

THE following is the method of obtaining the Calotype pictures:—

Preparation of the Paper.—Take a sheet of the best writing paper, having a smooth surface, and a close and even texture.

The water-mark, if any, should be cut off, lest it should injure the appearance of the picture. Dissolve 100 grains of crystallised nitrate of silver in six ounces of distilled water. Wash the paper with this solution, with a soft brush, on one side, and put a mark on that side whereby to know it again. Dry the paper cautiously at a distant fire, or else let it dry spontaneously in a dark room. When dry, or

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* Mr. Talbot has had the kindness to make me a present of several of his photogenic copies: some of them are of an admirable tone, and of a very fine effect. One cannot help regretting, on seeing them, that the reproduction of photographic images on paper is not more practised in our country.

nearly so, dip it into a solution of iodide of potassium containing 500 grains of that salt dissolved in one pint of water, and let it stay two or three minutes in this solution; then dip it into a vessel of water, dry it lightly with blotting-paper, and finish drying it at a fire, which will not injure it even if held pretty near: or else it may be left to dry spontaneously.

All this is best done in the evening by candlelight. The paper so far prepared the author calls *iodized paper*, because it has a uniform pale yellow coating of iodide of silver. It is scarcely sensitive to light, but, nevertheless, it ought to be kept in a portfolio or a drawer, until wanted for use. It may be kept for any length of time without spoiling or undergoing any change, if protected from the light. This is the first part of the preparation of Calotype paper, and may be performed at any time. The remaining part is best deferred until shortly before the paper is wanted for use. When that time is arrived, take a sheet of the iodized paper, and wash it with a liquid prepared in the following manner:—

Dissolve 100 grains of crystallised nitrate of silver in two ounces of distilled water; add to this solution one-sixth of its volume of strong acetic acid. Let this mixture be called A.

Make a saturated solution of crystallised gallic acid in cold distilled water. The quantity dissolved is very small. Call this solution B.

When a sheet of paper is wanted for use, mix together the liquids A and B in equal volumes, but only mix a small quantity of them at a time, because the mixture does not keep long without spoiling. I shall call this mixture the gallo-nitrate of silver.

Then take a sheet of iodized paper and wash it over with this gallo-nitrate of silver, with a soft brush, taking care to wash it on the side which has been previously marked. This operation should be performed by candlelight. Let the paper rest half a minute, and then dip it into water. Then dry it lightly with blotting-paper, and finally dry it cautiously at a fire, holding it at a considerable distance therefrom. When dry, the paper is fit for use. The author has named the paper thus prepared, Calotype paper, on account of its great utility in obtaining the pictures of objects with the camera obscura. If this paper be kept in a press it will often retain its qualities in perfection for three months or more, being ready for use at any moment; but this is not uniformly the case, and the author therefore recommends that it should be used in a few hours after it has been prepared. If it is used immediately, the last drying may be dispensed with, and the paper may be used moist. Instead of employing a solution of crystallised gallic acid for the liquid B, the tincture of galls diluted with water may be used, but he does not think the results are altogether so satisfactory.

Use of the Paper.—The Calotype paper is sensitive to light in an extraordinary degree, which transcends a hundred times or more that of any kind of photographic paper hitherto described. This may be made manifest by the following experiment:—Take a piece of this paper, and having covered half of it, expose the other half to daylight for the space of one second in dark cloudy weather in winter. This brief moment suffices to produce a strong impression upon the paper. But the impression is latent and invisible, and its existence would not be suspected by any one who was not forewarned of it by previous experiments.

The method of causing the impression to become visible is extremely simple. It consists in washing the paper once more with the gallo-nitrate of silver, prepared in the way before described, and then warming it gently before the fire. In a few seconds the part of the paper upon which the light has acted begins to darken, and finally grows entirely black, while the other part of the paper retains its whiteness. Even a weaker impression than this may be brought out by repeating the wash of gallo-nitrate of silver, and again warming the paper. On the other hand, a stronger impression does not require the warming of the paper, for a wash of the gallo-nitrate suffices to make it visible, without heat, in the course of a minute or two.

A very remarkable proof of the sensitiveness of the Calotype paper is afforded by the fact stated by the author, that it will take an impression from simple moonlight, not concentrated by a lens. If a

leaf is laid upon a sheet of the paper, an image of it may be obtained in this way in from a quarter to half an hour.

This paper being possessed of so high a degree of sensitiveness, is therefore well suited to receive images in the camera obscura. If the aperture of the object-lens is one inch, and the focal length fifteen inches, the author finds that one minute is amply sufficient in summer to impress a strong image upon the paper of any building upon which the sun is shining. When the aperture amounts to one-third of the focal length, and the object is very white, as a plaster bust, &c., it appears to him that one second is sufficient to obtain a pretty good image of it.

The images thus received upon the Calotype paper are for the most part invisible impressions. They may be made visible by the process already related, namely, by washing them with the gallo-nitrate of silver, and then warming the paper. When the paper is quite blank, as is generally the case, it is a highly curious and beautiful phenomenon to see the spontaneous commencement of the picture, first tracing out the stronger outlines, and then gradually filling up all the numerous and complicated details. The artist should watch the picture as it develops itself, and when in his judgment it has attained the greatest degree of strength and clearness, he should stop further progress by washing it with the fixing liquid.

The Fixing Process.—To fix the picture, it should be first washed with water, then lightly dried with blotting-paper, and then washed with a solution of bromide of potassium, containing 100 grains of that salt dissolved in eight or ten ounces of water. After a minute or two it should be again dipped in water, and then finally dried. The picture is in this manner very strongly fixed, and with this great advantage, that it remains transparent, and that, therefore, there is no difficulty in obtaining a copy from it. The Calotype picture is a negative one, in which the lights of nature are represented by shades; but the copies are positive, having the lights comformable to nature. They also represent the objects in their natural position with respect to right and left. The copies may be made upon Calotype paper in a very short time, the invisible impressions being brought out in the way already described. But the author prefers to make the copies upon photographic paper prepared in the way which he originally described in a memoir read to the Royal Society, in February 1839, and which is made by washing the best writing paper, first with a weak solution of common salt, and next with a solution of nitrate of silver. Although it takes a much longer time to obtain a copy upon this paper, yet when obtained, the tints appear more harmonious and pleasing to the eye; it requires in general from three minutes to thirty minutes of sunshine, according to circumstances, to obtain a good copy on this sort of photographic paper. The copy should be washed and dried, and the fixing process (which may be deferred to a subsequent day) is the same as that already mentioned. The copies are made by placing the picture upon the phothographic paper, with a board below and a sheet of glass above, and pressing the papers into close contact by means of screws or otherwise.

After a Calotype picture has furnished several copies, it sometimes grows faint, and no more good copies can then be made from it. But these pictures possess the beautiful and extraordinary property of being susceptible of revival. In order to revive them and restore their original appearance, it is only necessary to wash them again by candlelight with gallo-nitrate of silver, and warm them: this causes all the shades of the picture to darken greatly, while the white parts remain unaffected. The shaded parts of the paper thus acquire an opacity which gives a renewed spirit and life to the copies, of which a second series may now be taken, extending often to a very considerable number. In reviving the picture, it sometimes happens that various details make their appearance which had not before been seen, having been latent all the time, yet nevertheless not destroyed by their long exposure to sunshine.

The author terminates these observations by stating a few experiments, caculated to render the mode of action of the sensitive paper more familiar.

1. Wash a piece of the iodized paper with the gallo-nitrate; exposing it to daylight for a second or two, and then withdraw it. The paper will soon begin to

darken spontaneously, and will grow quite black.

2. The same as before, but let the paper be warmed. The blackening will be more rapid in consequence of the warmth.

3. Put a large drop of the gallo-nitrate on one part of the paper and moisten another part of it more sparingly, then leave it exposed to a very faint daylight; it will be found that the lesser quantity produces the greater effect in darkening the paper; and in general, it will be seen that the most rapid darkening takes place at the moment when the paper becomes nearly dry; also, if only a portion of the paper is moistened, it will be observed that the edges or boundaries of the moistened part are more acted on by light than any other part of the surface.

4. If the paper, after being moistened with the gallo-nitrate, is washed with water and dried, a slight exposure to daylight no longer suffices to produce so much discoloration; indeed it often produces none at all. But by subsequently washing it again with the gallo-nitrate and warming it, the same degree of discoloration is developed as in the other case (experiments one and two). The dry appears, therefore, to be equal, or superior in sensitiveness to the moist; only with this difference, that it receives a virtual instead of an actual impression from the light, which it requires a subsequent process to develop.

The above communication from Mr. Talbot was made to the Academy by Mr. Biot, who, at the same time, announced, that he had placed the specimens of sensitive papers sent by Mr. Talbot, in the hands of Mr. Regnault, member of the Academy, who has long devoted his attention to the production of Daguerrean images, in which he has been very successful. Mr. Biot adds the following remarks:—

"As the impressionable papers are destined to become of great utility to travelers, it will not be uninteresting to show that their use may be much improved, if the following precautions are taken:—

"1st. To prepare them always with paper of a very uniform texture.

"2ndly. To adapt to the camera object-glasses, which are not achromatic for the light; but the curves of which are calculated so as to collect, in one focus, all the invisible radiations which act most efficaciously on the impressionable substance employed in their preparation.

"3rdly. To keep them for a very few instants in presence of the objects to be represented, and to continue the development of the image out of their presence, by the influence of the solar radiation, transmitted through a red glass, in conformity with the singular property which the latter possesses, and which was so ingeniously discovered by Mr. Edmund Becquerel.

MR. BAYARD'S PAPER.

It is well known that, for many years past, Mr. Bayard has been in the habit of obtaining splendid proofs on various sensitive papers, of which he has reserved the copyright. In 1839, the Academy of Fine Arts announced the admirable discovery made by Mr. Bayard, in the following terms:—

"From the details into which we have just entered, the Academy, which has already been able to appreciate the merit of Mr. Bayard's images, is also enabled to judge of the degrees of improvement through which a process, which cannot yet have reached its highest perfection, has passed in so short a time. But, even were it to be considered, from the present time, as an invention already carried out to its furthest limits, what it is most important to know in all its details, are the properties which characterise Mr. Bayard's discovery, and the advantages which must render it precious for the arts.

"The Academy already knows that the proofs due to Mr. Bayard's process, are produced upon paper, by means of a preparation, which constitutes in great part the secret of the process. The quality of the paper that he judges most proper for insuring the success of his operation, is that of fine machine paper. He prefers white to colored paper, because the latter loses its color unequally, in consequence of the preparation which it undergoes, whence result blemishes, which are injurious to the picture; whilst white paper acquires, by that very preparation, a color which, beginning at the red tint, and passing through all the bistre tints, to arrive at the neuter tint, approaching to blue, produces a very agreeable general effect.

"Add to that, that the pictures produced by this process possess the property of being preserved like water-color drawings, from the moment that they have been fixed on the paper by a washing process; they may be carried about on a journey, kept in a portfolio, passed from hand to hand, without experiencing any alteration by time, and without being effaced by contact with other bodies.

"We have had a proof of this by the state in which we have found the greater part of Mr. Bayard's pictures, which have already been in circulation two or three months, without having experienced any sensible alteration: in order that they may retain all their vigor, it suffices that they be not exposed to the direct effect of too strong a light. They are, consequently, really drawings, both as regards their facility of preservation and the use that may be made of them; they are only destroyed by that which destroys every species of picture made by the hand of man—by that which produced them—light and time!

"The images are in their proper positions, which is another of the principal features of the process.

"Up to the present time, the applications of the process have been made principally to masses of buildings, details of interiors, works of art, statues, busts, figures, &c., which have all been reproduced with as much truth as effect. Amongst other applications, of which its author thinks it susceptible, and which he has tried with more or less success, we shall only mention that which consists in reproducing objects imperceptible to the naked eye, when seen and magnified by the solar microscope.*

"But one of the applications which we think belongs exclusively to Mr. Bayard's invention, and which would be of great utility for the art and those who cultivate it, would be the reproduction of prints, which our author has already practised with success."†

Mr. Verignon‡ has brought out a photographic paper, which produced very pleasing results with the camera; but, unfortunately, like most of the other papers invented, it is not highly sensitive; and this is what has induced him to give up its manufacture.

The following is the way to prepare it:

The white paper must first be washed with water acidulated with hydrochloric acid; then, after its dessication, passed through a solution prepared in the following manner:—14 parts of water to 1 of a mixture formed of two parts of hydrochlorate of ammonia, 2 parts of bromide of sodium, and 1 part of chloride of strontium. The paper, after being dried over again, is passed through a very dilute solution of nitrate of silver. There is thus formed, by a double decomposition, a chloride and a bromide of silver, which is rendered black by exposing the paper to the light during the space of half an hour. The paper thus prepared may remain sensitive during a fortnight, but, at the end of that time, the black will have penetrated through to the other side of the paper, which will have then lost its sensitiveness.

In order to obtain the protographic effect, it is only necessary to steep the paper in a very dilute solution of iodide of sodium, and to convey it immediately, wet as it is, into the camera, placing it so as to receive the luminous image. At the end of twelve minutes, if the weather be favorable, the photogenic effect is entirely produced. When once the image is obtained, nothing remains, in order to fix the picture, but to pass it in a very dilute solution of hyposulphite of soda and iron, and then to wash it in pure water: the operation is then completed.

* "Reproductions on paper may possess for certain objects of art a much greater charm than the Daguerrean pictures. The remarkable results obtained by Mr. Bayard leave no doubt in this respect. With an additional degree of expedition it will, perhaps, be possible to arrive at the taking of admirable portraits and views of a very fine effect. But, for all those objects which require a high degree of finish in the details, the pictures on paper will never be able to support a comparison with those on the silvered plates; the fibrous texture of the former will always be an insurmountable obstacle to perfection in reproductions of this nature."—(*Note by N. P. Lerebours,.*)

† The advantage possessed by Mr. Bayard's paper, over that of Mr. Talbot, for the reproduction of engravings, is, that the first gives the image immediately in its true position, whilst, on the calotype paper, the image is *reversed or negative;* that is to say, the blacks are in the place of the whites, and vice versa; and it is only by counter-proof that a positive image is obtained.

‡ Mr. Verignon's paper is excellent for the reproduction of engravings.

Mr. Lassaigne had employed, in April, 1839, for the reproduction of engravings, without the help of the camera, a paper bearing a great analogy with the above.

We entertained our readers in the chapter which treats of the continuating glasses, with the interesting researches of Mr. Edmund Becquerel. Mr. Talbot also appears to have made, at the same period, numerous investigations into the continuating properties of certain rays applied to his calotype paper.

We shall not give the description of all the sensitive papers which have been proposed, but confine ourselves to mentioning Mr. Raife, for his plated paper, and also, Messrs. Schaefhaeult, Hunt and Petzhold. We cannot, however, forbear giving the extremely simple preparation of a paper by Mr. Ponton, communicated by Mr. Edmund Becquerel.

MR. PONTON'S PAPER.

"Several months ago, Mr. Ponton made known his paper, a description of which we shall give hereafter. Its preparation consists in immersing a sheet of paper in a solution of bichromate of potassium, drying the paper, and then exposing it to the light. The action of the chromic acid on the paper is such that the parts exposed to the radiation become gradually colored, passing successively through the dark orange, and then the dark brown color; afterwards the paper is immersed in water, and all the bichromate which has not been exposed to the solar action is dissolved, and those parts only are imprinted on the paper which have been exposed to the light. By means of this paper, Mr. Ponton has copied engravings with success. A feeble representation of the object is thus obtained, the shades being represented by the whites, and *vice versa*, as with the chloride and bromide of silver paper. By studying the action of chromic acid on organic substances, under the influence of light, a subject which I am at present engaged on, I have been led to continue Mr. Ponton's process; and I have succeeded in producing a new paper, so as to represent, in the picture produced by the action of the solar radiation, the shades by the shades, and the whites by the whites, and to give not only another tint to the image, but greater vigor. It is only necessary to immerse a paper prepared after Mr. Ponton's manner, and on which there exists a faint copy of an image, into an alcoholic solution of iodine, to wash this paper in water, and then to dry it: the parts which were white become blue, and those which were yellow remain more or less white.

"The explanation in detail of this process is as follows. Having employed different sorts of paper, covered with a coating of bichromate, I found that they were not all able to reproduce pictures rapidly; that the mode of sizing the paper had an influence on the coloration of the light, and that, with unsized paper, this coloration was only accomplished in the course of time. From that moment, I perceived that the principal reaction took place between the chromatic acid contained in the bichromate, and the starch contained in the size of the paper. Then, as starch possesses the property of forming with iodine a combination of a very fine blue, I imagined that on the parts of the paper which had not been exposed to the action of the solar rays, the starch not having combined with the chromic acid, the iodine would form the blue iodide, and thus represent shades by shades.

"When it is desired to copy an engraving by means of this process, the course I have followed may be imitated. First ascertain that the paper is well sized, and that the starch is spread uniformly over its surface; for that purpose, steep in a weak alcoholic solution of iodine; then wash it copiously in water. By this second immersion, it must assume a beautiful blue tint, which the first did not impart to it. If this tint be uniform, the paper is deemed proper for the experiment; in the contrary case, the operator might size it himself with starch.

"It is afterwards steeped, in accordance with Mr. Ponton's method, in a concentrated solution of bichromate of potassium; then, in order that the paper may be colored uniformly, press it forcibly, after immersing it a few seconds between some sheets of blotting-paper, and then dry it, either by leaving it within the folds of the blotting-paper, in the dark, or by holding it to the fire. This paper to be very sensitive, must be very dry. When it is thus coated with the bichromate, it is placed on

a board, then covered with the engraving, taking care that the engraved side be placed upon the sensitive paper, and, with a sheet of plate-glass at top, press the two, one against the other, and expose them in that state to the solar rays. After a time, which varies between thirty seconds and fifteen minutes, according to the thickness of the paper of the engraving, the copy will be sufficiently marked (with a diffused light this time would be longer). Next, take off the engraving, wash the paper and dry it; when it is dry, steep it in a weak alcoholic solution of iodine, and, when it has remained there some time, wash it in water, and dry it carefully between the folds of some blotting-paper; but not before the fire, because, a little before 100 degrees, the iodide of starch becomes discolored. If you judge that the copy is not sufficiently brought out, repeat the immersion several times. By this means, you may obtain the intensity of tone that you wish the picture to have; which intensity you could not change at will, if you were to employ a more concentrated solution of iodine.

"When the paper is damp, the shades are a very fine blue; but when dry, the color becomes of a dark violet. I have found that, if covered over with a coating of gum-arabic, while it is yet damp, the color of the picture is, in great part, preserved, and is finer than when it is dry. When a paper is thus prepared, it loses a little of its tone during the first moments, but afterwards recovers and preserves its violet hue."

By means of this process, engravings and drawings may be faithfully copied, and that at a very small cost, for the preparation is not expensive, and is very easy in its application. However, the vigor of the picture produced is not equal to that of an engraving, neither has it so rich a tone. The last tints will be faithfully produced, and this copy will come very nigh to a stump-drawing.

The attempts made to reproduce the images of the camera with this sensitive paper, have not yet given any results which are completely satisfactory.

CHAPTER XXIV.

On the Transfer of the Proofs.

A great many researches have been made on the possibility of transferring Daguerrean images upon the lithographic stone. Up to the present time, these inquiries have been fruitless, and the only results which have attended them, consist in a method of transferring the image depicted on the plate, by means of a press, to a sheet of black paper covered with a coating of gelatine in a moist state. It is left in the press for about half an hour, and, at the expiration of that time, dried in the sun; the paper then separates from the plate, and tracings of the Daguerrean image, more or less complete, will be seen on its surface.

CHAPTER XXV.

MISCELLANEOUS.

Considerations Relative to the Chemical Action of Light.

A letter from Mr. Edmund Becquerel gave rise, in the Academy of Sciences, to a verbal communication from Mr. Arago, which we present to our readers nearly *verbatim.*

A short time after the law was voted granting a national recompense to Messrs. Daguerre and Neipce, some opinions, which in my idea were very erroneous, were entertained by a small portion of the public, which rendered it necessary for me to show that the discovery newly made was not to be estimated in respect to art only, but to the very valuable subjects for investigation which it presented in reference to the physical sciences. Such was the purport of a note, which appeared in the minutes of the proceedings at the Academy of Sciences, 19th August, 1839. It is in these terms:—

"The following is an application of which the Daguerreotype is susceptible, and which appears to me to be worthy of attention:—

"It has been proved by observation that the solar spectrum is not continuous; that there exist in it transversal interruptions of continuity; lines which are entirely black. Do there exist similar interruptions of continuity in the black rays, which the photogenic effects appear to produce?

"If so, do they correspond with the black lines in the luminous spectrum?

"Since several transversal lines of the spectrum are visible to the naked eye—

that is to say, when they are depicted on the retina without any amplification—the problem which I have just laid down will be easily solved."

This very easy solution of a problem which I had proposed to myself, I could not, in 1839, seek experimentally, the old camera of the Observatory having then been applied to another use, and the new one not being constructed. However, I must suppose that the subject, as proposed by me, was entertained; for I subsequently learned that the Royal Society, on the 20th February, 1840, received a communication from Sir John Herschel, in which the question is glanced at, and it will be remembered that Mr. Edmund Becquerel submitted the same subject to the Academy, in its sitting of the 13th June, 1842. Sir John Herschel not having at his disposal an helioscope, would not take upon himself to decide positively as to the existence of lines in the photographic image of the spectrum. Mr. Edmund Becquerel, on the contrary, projected on his iodized plate a stationary spectrum, and saw clearly after the experiment, in the region of the plate occupied by this spectrum, transversal lines, along which the chemical substance had remained unaltered, or at least had undergone no perceptible modification. He ascertained, moreover, that these lines corresponded exactly with the dark lines of the luminous spectrum.

At first sight, the experiment I have just spoken of might seem to be superfluous, for the result obtained was the one which must necessarily have been anticipated;—how can we expect a photogenic action where light is entirely wanting?

This is my answer: it is not at all demonstrated that the photogenic modifications of the impressionable substances result from the action of the solar light itself. These modifications are perhaps engendered by invisible radiations mixed with the light properly so called, accompanying it, and in like manner refracted. In this case, experience would go to prove, not only that the spectrum formed by these invisible rays is not continuous, but that there exist in it interruptions of continuity, as in the visible spectrum; moreover, that in the two spectrums, when superposed, these lines *correspond exactly*. This result, if true, would be one of the strangest and most curious ever known to the scientific world.

Let us introduce into the discussion an element depending for its action on the rapidity of the transmission of light, and the consequences of the previous observation will not be less interesting.

I proved, several years ago, that the rays proceeding from the stars towards which the earth is approaching, and those of the stars from which the earth is receding, have an exactly equal degree of refrangibility. Such a result cannot agree *with the theory of the radiation* of light; but, by means of an important addition to be made to that theory, the necessity of which struck me some time ago, and which has been generally well received by those who study natural philosophy: it must be admitted that luminous bodies radiate light of every degree of velocity, and that only those of a determinate velocity are visible, that they alone produce in the eye the sensation of vision. In the theory of radiation the solar red, yellow, green, blue and violet, are respectively accompanied by rays which are similar to them; but invisible by defect, or excess of velocity, in transmission. To a greater degree of velocity belongs a lesser refraction, as to a lesser velocity, a greater refraction. Thus each visible red ray is accompanied by invisible rays of the same nature, which are refracted, some more, some less, than itself: it is therefore positive, that there *exist rays in the black lines* of the red portion of the spectrum; the same must be said of the lines situated in the yellow, green, blue, and violet portions of it. Experience having shown that the rays contained in the dark lines, are without effect upon the impressionable substances, it is satisfactorily proved that all increase or diminution of velocity, in their passage, deprives the luminous rays of the photogenic properties with which they were primarily endowed; that the solar rays cease to act chemically from the instant that they lose, by a change of velocity, the faculty of producing on the retina the luminous sensations. I need not dwell upon the singularity of a chemical mode of action of light, which depends upon the velocity of its rays.

The same day on which Mr. Edmund Becquerel presented to the Academy the

result of the experiment which I had proposed two years and ten months previously, I invited him publicly to renew it, under other conditions which seemed likely to throw a light upon the manner in which the velocity modifies the chemical action of light. I showed that the solar rays, moving faster and faster as they traversed a medium which is more or less refrangent, some useful result would be obtained by studying, comparatively and simultaneously, the action of the spectrum upon the iodized plate, immersed by halves in two very dissimilar media ; in water and air, for example. Mr. Edmund Becquerel was kind enough to follow out this idea. The following is the letter which he wrote to me on the subject, dated 25th November, 1842.

"When you had the kindness to present to the Academy of Sciences, in the month of June last, my memoir on the constitution of the solar spectrum, you were good enough to suggest to me an experiment which was yet to be made, in order to ascertain if when a substance, impressionable by the action of the solar rays, is immersed in a medium different to the air ; the change of velocity of the solar rays, at their passage through this medium, would not alter the position of the lines, or transversal striæ of the spectrum of the chemical rays.

"I immediately applied myself to making these experiments, and began by using water as a new medium. My departure for the country forced me to interrupt them. I had intended to continue them, on my return, before making known the result; but the bad state of the season has not allowed me to realise my project. However, I have the honor to address to you the result of a double experiment, which I have made, as well as the description of the process which I followed.

"I made use of a small crystal vessel, with flat sides, and, of a plate prepared after Mr. Daguerre's manner, placed vertically in the vessel, in such manner that its surface was parallel to the front of the vessel. In the experiment, the distance between the iodized plate and the front of the vessel was one centimetre. I then introduced into the camera a bundle of solar rays, through a narrow crevice made in the shutter ; these rays were refracted through a very pure flint prism, in front of which was placed a lens with long focus, so as to obtain, by projection, a solar spectrum with all its striæ. When this result was obtained, I placed the vessel in the direction of the refracted ray, so that the spectrum imprinted itself horizontally with all its striæ on the iodised plate, and so that the violet rays entered normally at the front of the vessel. Before commencing the experiment, water was poured into the cystal vessel, until its level cut the image of the spectrum longitudinally into two equal parts.

"After the action had lasted one or two minutes, the plate was withdrawn and exposed to the mercurial vapors, the image of the spectrum was seen on it from the limit of the green and blue to much beyond the extreme violet ; and, as I stated in the Memoir, this image had all its striæ similar to those of the luminous spectrum, for those portions possessing the same refrangibility. No very sensible difference can be perceived between the image of the spectrum on that part of the plate which remained in the air and that immersed in the water: the striæ of these two portions of the spectrum seem to be a very exact prolongation one of the other, except, however, in the extreme portions of the chemical spectrum, on the right and on the left, where the striæ of the image produced in the water seem to narrow a little among themselves. It appears to me that this must be attributed to the refraction of the oblique rays.

"This experiment tends to show that the nature of the medium in which is immersed the substance, chemically impressionable under the action of the solar rays, does not modify their action, so that the impression of the solar spectrum upon that substance always produces the same lines, and at the same places.

"When the weather will permit, I intend to resume these experiments, to vary them, and I may, perhaps, succeed in obtaining more conclusive results.

"I have the honor to be, &c."

We thus see that the solar rays produce the same effect in the air as in water. In the air, however, according to the theory of radiation, the light progresses much slower than in water. The degree of velocity in this case has therefore no influence, a con sequence which, at first sight, seems in

manifest contradiction with the inferences which we have deduced from the first experiment. The two results, however, are not irreconcileable. It appears to me that a new hypothesis may make them agree; of this, however, every one will be able to judge.

The velocity with which a luminous ray traverses any given body, depends exclusively on the refrangibility of this body, on *the quickness of radiation of the ray*, and of the velocity which it had in vacuo. The ray which arrives at the surface of the coating of iodine, through the water, possesses, at the point where it meets the surface, a velocity superior to that which the ray moving through the air had at the same point; but, *in the interior of the coating itself*, at a sufficient depth, the two rays have exactly the same velocity. Let us only assume that the photogenic phenomena depend, not upon an action exercised at the surface, but on one which takes place in the interior of the coating and all difficulty disappears: only, singular enough, we are thereby compelled to establish an essential distinction between the interior and the surface of a coating of inconceivable thinness.

In thus considering the photogenic phenomena as examples of molecular action, susceptible of precise calculation, every one will understand how interesting it would be to introduce figures into the general reasonings which I have just presented. This end will be attained by completing, in the first place, the experiments, by means of which Mr. Dumas had begun to determine the thickness of the coating of iodine, upon which the Daguerrean images are formed, from the comparative weighings of a large silvered plate before and after its iodization. The greatest degree of exactness which is possible must then be used in the observation of the relative positions of the dark striæ on the impressionable matter, even by having recourse to the assistance of the microscope, if necessary; in fine, instead of passing, by a sudden transition, from air to water, it will be well to compare the relative positions of the striæ produced in two media, slightly different in density or in refrangibility. Even as the case now stands, *in accordance with the theory of radiation*, the following propositions are rigorously deduced from the discussion which I have just gone into.

If the photogenic effects of the solar light result exclusively from the action of invisible rays, mixed with the visible rays, progressing with them, and with velocities of the same order, the superposed spectra of these two species of rays have their interruptions of continuity exactly at the same points.

If the visible rays produce the protogenic effects wholly or in part, this property must depend exclusively on their velocity; and they lose it equally when this velocity increases as when it diminishes.

The photogenic effects of the solar light, whether they are caused by visible or invisible rays, cannot be attributed to an action exercised at the surface of the impressionable coating; it is in the interior of the impressionable matter that the centre of this kind of action must be sought.

The foregoing conclusions may be further extended when it shall be known what is the thickness of the thinnest coating of iodine in which are produced the Daguerrean phenomena; when it shall be possible to compare that with the length of the *accesses*, or that of the luminous undulations.

Recorded facts serve as much to the advancement of the sciences as theories; we must not, therefore, be much surprised at seeing collected, with so much care, a multiplicity of experiments, which at first sight appear only curious; but the whole of which, taken together, may in reality serve to establish theories, and consequently to give the explanation of a great number of isolated facts.

It will have been observed, that the explanation of what takes place in the formation of the Daguerrean images is not entirely satisfactory to the mind; it is therefore, not impossible that the adjunction of certain facts, which seem to have a more or less direct bearing on these phenomena, may contribute to negative, rectify or confirm the existing theory. It will be already surmised that we allude to the experiments of Mr. Moser, and to those which have reference to them.

These experiments are of the most curious character, and perhaps even derive their singularity from their very mysterious nature; and we have no doubt that a great number of amateurs will apply themselves

to repeat them; and as, in all these experiments, a slight modification in the manner of operating may bring about a totally different result, we earnestly recommend experimentalists to keep an exact journal of their observations, as the multiplication of facts can alone lead to the explanation of such remarkable phenomena. Whether these phenomena are produced by the action of the luminous radiation of bodies in the deepest darkness; whether they are the result of an evaporation of organic matter carried off by the vapor of water; or lastly, whether they are only produced by thermographic or electrographic actions, is what we will not allow ourselves to discuss; our province is here merely that of the historian: we shall, therefore, confine ourselves to relating, in chronological order, the experiments which have been made.

To be continued.

LUTHER HOLMAN HALE AND THE DAGUERREAN ART.

BY R. W. KEYES.

Among the many valuable and astonishing discoveries made in this nineteeth century, that of the great Daguerre takes a very high position. Daguerre was the great originator of the Photographic art; the first who had the boldness and ingenuity to mould the sun-beam into an artist's pencil, and convert the shadow into a substance. The great Photographer won for himself, not only an independent fortune by his discovery, but also an imperishable name; a place on the scroll of fame, among those, "whose names were not born to die." Yet it cannot be said that he perfected the art. This was left to after experimentalists, the majority of whom, we are proud to claim as our countrymen. Still, with all the wonderful improvements in view, that have been made from time to time, we presume that Dagnerreotyping is in a comparitively rude state, to what it will be in a few years hence. If a devotedness to the profession; a daily toiling in search of the still partially hidden principles of the art, which is constantly bringing forth some new application from the laboritories of Daguerreans; if a love of the art for its own sake, will not make some new developments, that will be equally astonishing with the discovery itself, then shall we be content in believing that the poet was in fault when he said:

> "Attempt the end, and never stand to doubt;
> Nothing's so hard, but search will find it out."

Among the many distinguished Daguerreans of our own country, standing out in bold relief, with the names of Brady, Lawrence, Harrison and Morand, is that of the subject of our present sketch.

Luther Holman Hale was born in Milbury, Massachusetts, on the 21st of September, 1823. His father was an extensive scythe manufacturer, possessed of ample means, and what is more, a disposition to aid his son in obtaining a good education.

In early life, young Hale showed himself to be possessed of more than ordinary mechanical ingenuity, having at the early age of sixteen, acquired a good practical knowledge of his father's business. Desirous of obtaining a good English education, he entered Hopkinton Academy, where during his Academical course he distinguished himself as being a close student, and a more than ordinary chemist. Having completed his studies, he graduated with the highest honors of the Institution, and with the respect and good will of his class-mates, to whom he had endeared himself by his urbanity and winning manners. The subject of our memoir now sought some occupation more congenial to his tastes, than toiling at the anvil, or tem-

pering steel. He engaged in the "shoe business," and made a tour in the Western country; but, although tolerably successful, the business was not satisfactory to him, and he at once made up his mind to become a Daguerreotypist. He entered the office of his brother in Milk st., Boston; but for some reason, that is unnecessary to explain, after having obtained a very good knowledge of the art, he left the office of his brother, and connected himself with a Dry-goods House. In this business he was not destined to remain long. The occupation was not suited to his taste, and he again became connected with his brother, determined to pursue the profession of his choice, whatever obstacle might oppose. With such enthusiasm and devotion to the art, it is no wonder that our young artist rapidly rose to eminence in his profession. He very soon acquired a distinguished reputation.

The multiplying samples of poor pictures which misrepresented this noble art, in the hands of taste and genius, soon gave place to productions of great merit.

Men may, and do, often rise to exalted stations in life, through influences which they had no hand in creating; birth, education, noble and distinguished parentage, often give a man position in life, which he never could have attained without them, and at the best, which he can but imperfectly fill.

Not so with the artist. His works are his judges. By his fruits is he known. All the wealth of the Indies cannot purchase the genius and talent, that shall rival in excellence the portrait of an Elliot, the landscape of a Durand, or the historical piece of a Huntington; neither can it make the common daubs, that are daily sold under the hammer, equal the works of the "Old Masters."

The Daguerreotypist, equally with all other artists, must rely simply on his own genius and skill; with these, he will succeed; without them he will fail. With this conviction, Mr. Hale commenced his labors in 1842. His thorough knowledge of Philosophy and Chemistry, were now brought into immediate requisition.

Frequent complaints were made that the sittings were too long. From the fact that the countenance of the "human face divine" changes so rapidly and so often, it became a source of perplexity to the real lover of the beautiful, that the long sittings often marred the beauty of the picture, and produced anything but a satisfactory result to a real artist. This hindrance to the perfection of the art, became a special subject of study and reflection. Numerous experiments were made, the best chemicals were procured, new preparations were formed, and our young Daguerrean enered into the business with all the enthusiasm of a real lover.

The art was then in its infancy, and each practitioner was obliged to strike out a path of his own, unaided by the experience of others. Thus relying solely upon his own resources, Mr. Hale, as if by intuition, suggested, brought forth, and carried forward to successful completion, experiment after experiment, until he produced pictures, which for distinctness of feature and outline, brilliancy of color and tone, artistic arrangement and effect, rivalled the finest efforts of the most gifted pencils. Without wishing to detract from the merit of any of Mr. Hale's numerous cotemporaries, we may safely say, that his pictures are rarely equalled in all the different features that go to make up a good picture, and, are never excelled.

Having now established his reputation on a firm basis, his business increasing with it, our Artist was obliged to obtain more commodious rooms, and having dissolved his connection with his brother, removed his office to Washington street, where he has fitted up one of the most magnificent saloons in Boston,—probably in the United States. All the arrangements have been made, seemingly without regard to cost, and merely at the dictation of a refined taste. The piano-forte, the music-box, the singing of birds; the elegant drapery; the beautiful pictures; the expensive gallery of portraits; the struggling sun-beam peering through doors of stained glass; statuary, engravings; all, all seem to impress the visitor with the idea of palace-like magnificence, and serve to soothe the troubled spirit, and calm the anxious brow, preparatory to the obtaining of a good picture.

Mr. Hale has, until within a year and a half, been connected with Mr. Benjamin French, in preparing artist's materials, and has established an enviable reputation, in the preparation of his chemicals, which have

been pronounced by the most eminent in the profession, if not superior, at least equal to any in use. He is now reaping a rich harvest, consequent upon a ten years devotedness to his profession. He entered upon his duties with a determination to improve, to excel, and nobly have those determinations and hopes been realized. His history presents a picture worthy of imitation. Generous and free, with an eye single to the advancement of the art which he all but worshipped; his mind filled with the images of beauty and excellence, which he labored hard to imitate; with aspirations elevated above the mere grovelling idea of present gains, he devoted himself to his chosen occupation with an assiduity that would admit of no denial. His motto has always been, "Do one thing at a time, and do it well."

For hours and days even, has he been known to devote himsºlf to the improvement of apparatus, to the perfecting of some change of chemicals, when others would have been content with the remuneration they received in dollars and cents, perfectly satisfied if their customers were. This short sighted policy has prostrated the business of the latter, while that of Mr. Hale has increased, by the constantly extending patronage which he is receiving from a discriminating community; who, although slow to find out, yet will most assuredly detect error and imposition, and finally bestow reward where real merit exists.

Mr. Hale has now reached his twenty-eighth year, and the ninth of his artistic life. His course, though noiseless and unobtrusive, has nevertheless been onward.

Puffery and trumpeting have ever been distasteful to him, and while some may have been engaged in sounding their own praises at the "corners of the streets," he has been at work in his laboratory, testing some new principle. This, we conceive to be the true vocation of an artist; his own works should praise him.

Mr. Hale is universally respected by the profession, and also by the large circle of friends in which he moves, who, from his past life, are encouraged to hope for still better things in the future.

THE AMERICAN ART-UNION.

BY J. K. FISHER.

Mr. Editor:—The liberality which in your last number you evinced by copying at length the article of the Art-Union, which sets forth its own extravagant claims upon public sympathy and support, and denounces its opponents in a manner deliberately intended to express the utmost contempt for their powers and the utmost censure upon their motives, is a contrast to the spirit of the organ of that concern, which never publishes a line from the pens of its opponents, unless it be for the sake of some errors of orthography or grammar, or some other matter on which it can found a pretence that its opponents are illiterate and vulgar persons, beneath its serious notice. I propose, since you have thus with one-sided liberality laid their representations before your readers, to make a few comments upon them, if you will allow me.

After glorifying itself for what it has done, and for its success, it says that its beneficence has drawn upon it the "attacks of envy and malice and disappointment, which have been hitherto harmless." This is the spirit in which it has ever treated those who have expressed independent opinions, and not bent under its yoke; it has never replied to their arguments, but uniformily impugned their motives, and elaborately inculcated the idea that they were so manifestly vicious and impotent that their hostility did no harm, but much

good, to the Art-Union. With eighty thousand a year to spend in rewarding its vassals and punishing its opponents, it has until lately kept the great multitude of artists quiet and seemingly loyal, and by every mode of spoken and printed slander, uttered through the mouths of its parasites and the columns of journals, bribed by advertisements of near three columns in length, it has labored to reduce to the extremest pecuniary want every artist who has shown the slightest appearance of a firm and manly spirit. If this were not its design, why, even were it true, should it have published that it had declined to purchase my copies? is there in the world a respectable dealer who would have thus tried to represent works offered to him as unworthy to be purchased, while at the same time he was sedulously representing that the trashy works he did purchase were the best in the market. And after I publicly contradicted this calumny, they published another number of their instrument of domination, the Bulletin, still adhering to their insolent pretence that their assailant had not the power to cause their own veracity and honor to be suspected, even by an explicit and public denial of their allegations. If any gentleman had been contradicted thus explicitly and publicly, in relation to a fact which he alleged to have occurred before a committee, he would forthwith have published the proof of his allegation, unless his antagonist were a notorious liar; and the neglect to do so is equivalent to a declaration that his antagonist is so well known for a liar, that he has no power to impeach the veracity of anybody. With all this plainly before it, the Bulletin for May says not a word of my denial. Such is the mode of exterminating warfare which the Art-Union carries on against me; and I attribute it to the provocation I gave soon after my return from Europe in '48, by attempting to establish an Artist's Art-Union, a measure which, I was informed at the time, excited the indignation of some of the committee. This unlucky step of mine was premature, because the truckling patience of artists was not yet exhausted. Two years later a renewal of the attempt, by Mr. Whitley and myself, was successful in getting up an association which now numbers eighty-six members, bound together by their sense of the outrageous tyranny of the Art-Union; but, I regret to add, not wise enough to repudiate the principles of the Art-Union's constitution, instead of merely revolting from the sway of its directors.

They assert that their opponents have caused attacks to be published in newspapers hundreds of miles off. To the best of my knowledge and belief this is false; whatever newspapers out of the city have done, I believe they have done without pay or persuasion from these opponents. And whatever has been said against these opponents has been in papers that published large advertisements for the Art-Union; and the Evening Post, the Home Journal, and other papers that honestly presented the truth to their readers, got no advertising custom at all out of the thousands lavished on city papers last autumn and summer. The funds of the subscribers were squandered in muffling the press, and overturning that criticism which would have annihilated its constitution, and elected new directors.

They complain that we have attacked their expenses. True; we showed that the management of their business absorbs twenty-three per cent of all their income from subscriptions; and that their subscriptions waste a great deal more; and that less than half goes to the support of artists or art; and that this modicum is villainously misapplied; and that the drawers of prizes are so ill satisfied that hundreds of them sell them for whatever they can get. And they *complain* that this attack upon their expenses is unfair. And in defence they say, that the boxing and dispatching of bulletins and engravings and paintings, to all parts of the nation is not to be done at small expense. I am of opinion that this plea is good so far as this; that the expenses are almost inevitably so great that the prints and bulletins are not of sufficient value to pay them, even if their first cost were nothing; and this is a good reason for not publishing them. And as to the paintings, whose transit is paid by the drawers, their value is sometimes insufficient to pay for it; and this is a good reason why the lottery should be for money prizes, to be expended at the pleasure of the drawers, wherever and whenever it might suit their convenience. All these expenses of bringing pictures from distant

places where they are painted, most of them to be rejected; and then of sending to their distant destinations those that are purchased for distribution, there to be rejected in many instances, and again transported, or sacrificed in distant markets,—all these expenses, I do believe, render the results less satisfactory to the subscribers than would be the distribution in money prizes, to be expended for works of art, of one third of the amount that remains, after paying the ten per cent to hirelings called *honorary* secretaries, and the other expenses which may be really necessary.

They complain that their management has been attacked. Their managers are greedy of dominion, tyrants, who have not the good breeding to respect the liberty of the subscribers who set them up, nor the artists whose retired habits render them too submissive and unresisting victims of their grinding and insulting oppression. The Neapolitan despot who bombarded Palermo and Naples three years ago is not more tyrannical at heart than these oligarchs; and his disunited and discouraged subjects are not more disloyal to honor, and to the sovereign ruler, than are these supine and discouraged artists, who might face mere bodily danger with sufficient nerve, but who cannot see that they are bound to come out singly if they cannot come unitedly, and protest and struggle against an oligarchy of false pretending quacks, who are cutting off all communication between artists and their patrons.

They say their *plan* has been attacked, and that of the London Art-Union preferred; and they reply by counter-attack, affirming that the London plan is bad, in that it requires that even its prizes must be expended for a work of not less value than the prize (though it may be of more value if the drawer chooses to pay the difference;) and in that it makes the "institution a mere collector of money, to be expended by no one knows whom, for no one knows what;" and in that it assumes that artists are better able to fix their prices than are "others who are familiar with the prices and the works of all." The defective points in the London plan might be amended; the only functions of the institution should be to collect and disburse the money, and to establish galleries *upon economical principles.* And artists can no more *fix* their own prices than they could if they sold for cash; and when a drawer had selected a work he would keep it, and not sell it for less than a quarter of its first cost, as is now sometimes done by those who draw prizes in the American Art-Union.

They again reiterate their stale pretence that under no other system could they have "the attractive free gallery." This gallery cost the subscribers thirteen thousand per year. But I will venture to assure any capitalist—nay, I will pledge him my whole property and possessions, if he will engage with me in the enterprise, that a free gallery may be supported by letting the walls to artists, without one cent of tax to patrons of art; and with great saving to artists, inasmuch as it would relieve them from the present necessity of having rooms in expensive public streets, and large rooms withal. But if not, still the subscribers can pay for the gallery under the free system as easily as under the oligarchic one; and the New England and Philadelphia Art-Unions both have free galleries.

Then comes some superb moralising about lotteries. They say, first, that they have a legal authorisation to draw a lottery; second, that they have no lottery; third, that nobody else has a right to dispose of pictures by lot; and fourth, that they would have indicted a rival concern, (Goupil & Co., I presume,) had it not been from fear that their motives would have been misconstrued. They have not a word in their published charter which authorises them to draw a lottery, or distribute by lot, and several lawyers say that they are violating the statute: they have a lottery every year. If the statute intends to prohibit lotteries such as the gift concerts and "homestead art-unions," it also intends to prohibit such as theirs; and if they are right, and the others wrong, their vile cowardice in not prosecuting should at once consign them to coventry.

And lastly, they talk about the great numbers of the gentler sex, and the ministers of religion, and the educated generally, whose names honor their lists. Had not Goupil & Co quite as respectable lists? and such people, they add, would have nothing to do with gambling, or "a mere lottery for paintings." Thus do these insolent tyrants attempt to brand as gam-

blers all but themselves who dispose by lot of works of art, and to clutch for themselves a monopoly of the only mode in which works of great value can be sold in this country. And to support them in their atrocious career of oppression and calumny, they have for many years obtained by their false pretences from eighty to nearly a hundred thousand dollars from the credulous friends of art, and the thoughtless who like the sport of a lottery. I hope that before more power is furnished to these twenty-one tyrants, the inconsiderate dupes of such an imposition will look at the trap. That some of them will is to be inferred from the fact that two-thirds of the old subscribers fell off year before last: how the remainder held on last year we do not yet know; for, so far as I can learn, they have not furnished us with their usual list of names, alphabetically arranged, by which we might possibly discover a still greater falling off of the more recent dupes of a most stupendous imposture.

CALCIUM AND ITS COMPOUNDS.

Calcium is the metalic basis of lime, and is procured in very small quantities. It was first obtained in 1817, by Sir Humphrey Davy, by forming the carbonate of lime into a paste with water, placing it on a platina tray, connected with the positive pole of a galvanic battery, and putting a small globule of mercury into a cavity made in the paste, which he brought into contact with the negative pole. By this means the oxygen was expelled; the calcium attracted to the negative pole, and combined with the mercury, forming an amalgam. This being exposed to heat, the mercury was driven off and the calcium remained.

Chloride of Calcium is formed by heating lime strongly in chlorine gas, when oxygen is given off. It may also be prepared by heating dry muriate of lime to ignition; or by saturating dilute muriatic acid with chalk or white marble, then filtering and evaporating to dryness. Chloride of calcium is very deliquescent; it has a bitter taste, and dissolves in one-fourth its weight of water at 60° F. It is soluable in alcohol, imparting a red color to the flame when it is kindled. From its strong affinity to water it is much used for drying gases and absorbing the water from ethereal and oily liquids in organic analyses. For this purpose it is used in the dry state. In its hydrous or crystalized form it is much used in the preparation of freezing mixtures with snow; in which case the evaporation need only be conducted so far that the whole becomes a solid mass on removal from the fire. For both this and the last mentioned use it is reduced to a powder. It is also much used as a test for sulphuric acid, with which it produces a white precipitate, insoluble in nitric-acid; in the rectification of alcohol, and for forming a water bath with a high boiling point. A very good dry sensitive may be made of chloride of calcium by the addition of bromine until it assumes an orange color.

Bromide of Calcium may be made in the same manner as the bromide of lime; as also the—

Iodide of Calcium, and both may be used to advantage in coating the daguerreotype plate.

Fluoride of Calcium with bromine makes a good sensitive, but should never be used as the fluoric acid is apt to attack the lenses of the camera and destroy them.

Oxide of Calcium.—This is the common lime of commerce, and is one of the most important substances in nature. It is obtained by exposing the carbonate of lime to a red heat, by which means the carbonic acid is expelled White marble put into a crucible and heated in a furnace for two hours, yields the best and purest lime. Lime, caustic or quick lime, is of a a pure white color and earthy appearance. It corrodes animal and vegetable substances, has a burning caustic taste, at-

tracts moisture and carbonic acid rapidly from the atmosphere, and is easily reduced to powder. It is one of the most infusible bodies known. It has a powerful affinity for water, and the combination is attended with a great increase of temperature, a phenomenon which may be daily witnessed in the familiar process of slacking lime for the use of the builder. The result of this union with water is the formation of a white bulky hydrate, which parts with its water at red heat. This is termed the hydrate of lime. Lime readily unites with the acids, and forms salts, nearly all of which may be made by directly neutralizing the acid with the hydrate or carbonate of lime. They may also be made by double decomposition. Lime, when strongly heated, becomes phosphorescent, and emits a brilliant light; and on this account is sometimes employed for illumination.

Hydrate of lime is very sparingly soluable in cold, and less so in hot water. It has been found that one grain of lime requires 778 grains of water at 60° F. for solution, 97 1-2 grains at 130°, and 1270 grains at 212°.

Lime may be detected in solution by sulphuric acid, by carbonate and bicarbonate of ammonia, and potash, and by phosphate of soda; all of which throw down white precipitates.

Chloride of Lime.—This valuable salt which is now so extensively used in a variety of ways, is easily made in large quantities, by saturating slacked lime with chlorine gas; the union readily takes place with the evolution of caloric. Dry chloride of lime parts with its chloride when exposed to heat, a change which also takes place when the salt is kept for a long time in a dark place. Chloride of lime is decomposed by acid; and in order to have the full effect of its bleaching properties, it is necessary to add a small quantity of acid to disengage the free chlorine. The value of this salt depends upon the quantity of chlorine it contains, to ascertain which, sulphate of indigo diluted with water is to be added to a dilute solution of the chlorine; the quantity of chlorine being indicated by the quantity of the indigo solution it is capable of bleaching.

Lime is extensively used in the Daguerreotype process for making sensitive coatings. Almost every operator—who makes it at all—has his own peculiar method of mixing it with bromine. We will, however, give a general view of the method of making the compound.

Agitate bromine with lime in a glass bottle until it assumes a bright orange color, or deep red. We find that the color of bromide of lime depends very much on its dryness. This is the most simple method. Various other substances are added by different artists, for the purpose of giving different tones to pictures, and to render the mixture more permanent. Finely powdered alum—about a table spoonful to the quart—answers this purpose. Hydrofluric acid is often put in with the bromine, but we think it should never be used on account of its destroying the glass, and as we have said in a former number, ruins, in the course of time, the lens of the camera.

Since commencing this article we have received a communication—which will be found in another column—on "Daguerrean Chemistry," from N. G. Burgess, Esq., which enters into this subject so fully that it renders the remarks we intended to make quite superfluous. Mr. Burgess promises us other articles on the same subject. Being a practical Daguerreotypist, and having devoted much of his time to the study of this particular branch of the art, we know of no one more capable of handling the subject to the profit and instruction of his fellow artists.

For the Photographic Art-Journal.

DAGUERREOTYPE CHEMISTRY.

BY N. G. BURGESS, DAGUERREAN, N. Y.

This portion of the Photographic art has not received that due attention in this country which it has demanded, from those who profess it and follow it as an occupation. With a view to interest those engaged in the art, I will offer a few suggestions and hints that may possibly be of service to those who are desirous of producing good results.

It has been the experience of the writer of this, to follow the improvements which have been effected in Daguerreotyping since the early part of the year 1840, when he made his first pictures, in Paris, which consisted of views of public buildings, and those only with dry iodine.

The use of all the various sensitive mixtures or chemical compounds employed by Daguerreotypists for reducing the time of exposure in the camera, are discoveries which owe their origin to the necessities of the Art, and constitute no part of Mr. Daguerre's discovery.

It was found that there would be no practical result, from the use of pure iodine alone in the production of portraits, and the attention of the early operators was turned to the subject, in order to find some substance which would render the action of light upon the plate apparent in less time.

Accordingly we find that Mr. Claudet, of London, early in 1841, used chlorine combined with iodine, from its well known affinity to the latter substance, and the time was lessened very materially. Very soon after this, bromine, from its close resemblance to chlorine, was used in connexion with chloride of iodine, and the time was still more abridged.

This compound has been found to produce as good results as any combinations which are employed at the present day.

It has been found that all those Daguerreotypists who manufacture their own sensitive compounds, are the most successful in their operations, whereas those who are wholly dependent upon the chemist, will oftener fail; it becomes necessary, therefore, that one should be conversant with the nature of the chemicals employed, in order to their perfect combinations.

Chloride of iodine, when properly prepared for the Daguerrean artist, should emit strong yellow fumes on removing the stopper from the bottle, and there should always remain a small quantity of pure iodine at the bottom. It is frequently adulterated with the tincture of iodine (which nearly resembles the chloride), in which case, it is utterly useless as a sensitive ingredient.—Unless the fumes escape on opening the bottle, it is of no avail in preparing the mixture.

Bromine should always appear of a deep cherry red color, approaching a black, and of an oily appearance on the sides of the bottle. The qualities of this article are various. But that which is known as the German Bromine is said to be superior. Yet the American Bromine has been pronounced by some as equally good.

The following are the proportions which have been adopted in using the combination of chloride of iodine and bromine, viz:

To one ounce of chloride of iodine, add half an ounce of bromine—mix in a small bottle, and when well combined, dilute with one quart of soft water. Use this mixture in the coating box, after adding six times its bulk of water. But as the weight of either substance is always uncertain, owing to their peculiar nature, the compound itself will often vary in its action upon the plate. From this cause alone many persons fail in the mixture itself, and arrive at very unsatisfactory results. This may be obviated by observing the first coating as it appears upon the surface of the plate. If too much Bromine is present, a yellow color will appear when the plate is exposed to the sensitive mixture, and assumes a cloudy appearance.

The mixture must then be reduced in strength by adding more water and more chloride of iodine. This sensitive can be used with the various methods of coating—all of which will produce their own peculiar tone. But the deep golden yellow on the dry iodine, and the cherry red over the sensitive, with the deep purple for the last coating over the dry, will insure good pictures—all other accessories for good work

being well attended to, such as the proper cleaning of the plate, the proper adjustment of the light, &c.

The foregoing receipt, although long in use and held in high estimation at the present day, has been almost superceded by the introduction of the Bromide of Lime or Dry Sensitive. This consists of pure Bromine combined with Lime in the proper manner, to be applied at will upon the surface of the plate in such proportions as may be desired.*

In consequence of the facility of making and employing the Bromide of Lime, it has been adopted by many of the most successful operators throughout the country.

The following is the most approved method of preparing the Lime, and adding the Bromine.—Slack the lime by covering about one pound of the hard stone lime with water, and allowing it to become a fine powder. Then dry it over a slow fire or by the sun, and be sure that all the moisture is expelled from the lime. To about one quart of this lime add gradually, in a glass stoppered bottle, one ounce of pure bromine, and if it is in a proper state it will immediately be absorbed, and changed to an orange red color. There should be no fumes of bromine apparent over the surface of the lime. This whole quart of lime may be placed in the coating box, and it will coat a plate in about ten seconds after it comes from the dry iodine. This will continue for two or three weeks, when it may become necessary to add a few drops of bromine to the lime in the coating box.

The various coatings may be used with this preparation that are adopted with other sensitive mixtures, but the best results are obtained by coating first over the dry iodine to a deep golden yellow, and over the bromine to a cherry red, and lastly over the dry to a deep purple. This coating will insure a deep tone picture—where the blacks will indeed appear black; nor will there appear any of that greyish appearance upon the drapery which is so objectionable in many specimens of the art. This greyish appearance is always obtained when the heavy coating is adopted, and a large deposit of mercury given after the plate comes from the camera. It consists of coating as follows, viz: First over the dry iodine to deep red, then a purple over the bromine, and lastly, on the dry iodine to a steel blue. Pictures with this last coating will appear of great strength of tone, but will lack a brilliancy and clearness of finish which is so desireable.

The Bromide of Lime as a sensitive mixture is therefore preferred to all others, not only from its portability, but for its constant action and uniformity of strength. It will no doubt be used by all operators, when sufficient experience has been attained, by the profession, in its use.

* See article Bromine and its Compounds, page 110 of this Journal.

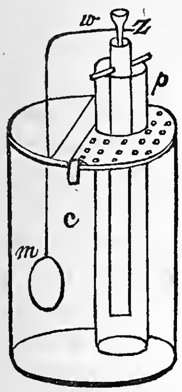
Substitute for Plumbago.—The *gradual* growth of electrotype metal over plumbagoed surfaces is, in many cases, a practical objection of considerable moment. Mr. Pellatt tells us (and we have to thank him for many practical hints of this kind), that they now use in Elkington's Manufactory, the following preparation.—Zinc is melted in a ladle until at the point of burning, when a few pieces of iron are dropped into it. When cold, the mixture is very friable. They reduce it to a fine powder, which is mixed with the plumbago, and apply as usual.

Electrical means for obtaining pure Hydrogen.—A means, often adopted in the laboratory, is to fill a platinum vessel with acid water, and invert in a similar liquid; and then to place on it a piece of zinc. The liberation of hydrogen immédiately commences on all parts of the platinum, on the inside, as well as on the outside. The gas liberated within the vessel, of course, displaces the acid water, and thus, by electrolytic means, pure hydrogen may be readily obtained.—*Brande's Lectures*, Dec. 19, 1843.

ELECTROTYPE MANIPULATIONS.

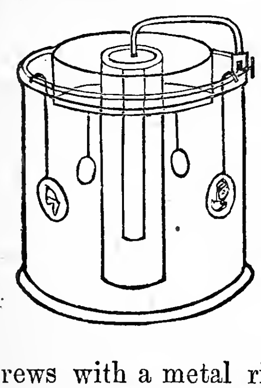
BY CHARLES V. WALKER,
Honorary Secretary to the London Electrical Society.

PART 1.



SINGLE-CELL APPARATUS.—The annexed wood cut (Fig. 1.) represents a single-cell apparatus, constructed on the principles laid down. Z is a rod of amalgamated zinc, *m* the mould, *w* the wire joining them, *c* the copper solution, (§ 37.) *p* a tube of porous earthenware, containing a solution of acid and water. (§ 48.) To put this in action, pour in the copper solution, fill the tube with the acid water, and place it as shown in the figure. *Last* (§ 60.) of all put in the bent wire, having the zinc at one end and the mould at the the other. Another form of this apparatus is given in the annexed wood-cut. (Fig. 2.) The zinc is connected by a wire and

Fig. 2.



binding screws with a metal rim, and on the latter can be hung several moulds, as in the drawing. Things are much more likely to go on well when several moulds, as thus, are operated on, than when only one is thus introduced. The reason will be manifest hereafter. (§ 63.)

47. The following precautions must be observed in using this apparatus.—The copper solution must be kept saturated or nearly so :—this is effected by keeping the shelf well furnished with crystals. The mould must not be too small in proportion to the size of the zinc. The concentrated part of the solution must not be allowed to remain at the bottom. In the latter case the copy will be irregular in thickness,—in the former the metal may be a compact brittle mass ; or may be deposited in a dull red, a violet, or a black powder. The nature of these several depositions will be elsewhere alluded to ; (§ 62, &c.) so will also the relative proportions of the zinc, &c. (§ 81.)

48. A valuable improvement was devised in Russia, by Professor Jacobi,* and in England by a Member of the Electrical Society, Mr. Mason.† It consists in using a decomposition cell, analogous to that already described. (§ 11.) The constant voltaic pair (§ 17.) of copper and zinc is used in the generating cell. (§ 36.) To the end of the wire attached to the copper is fastened a *plate of copper :* to the end of the wire attached to the zinc is affixed *the mould.* The sheet of copper and the mould are placed face to face in the decomposition cell : this cell is filled with a mixture of one part *sulphuric acid*, two parts saturated solution of *sulphate of copper*, and six or eight parts *water.*

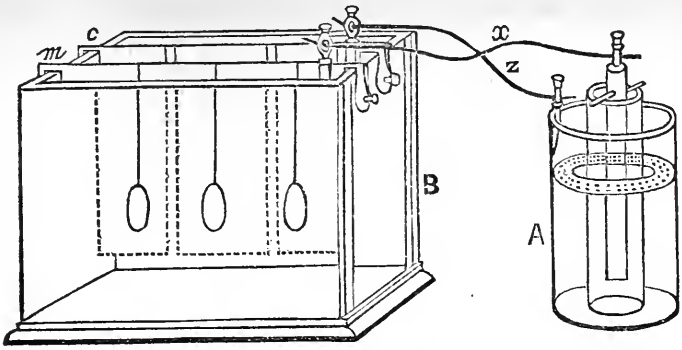
BATTERY APPARATUS.—This arrangement will be better understood from the annexed figure. *A* is a cell of Daniell's Battery, elsewhere described ; (§ 19, 56.) *B* the decomposition cell, filled with the dilute acid solution of sulphate of copper ; *c* the sheet of copper to furnish a supply ; *m* the moulds to receive the deposit. To charge this, pour in the several solutions : hang a piece of copper on the brass rod *c ;* connect this rod with the copper of the generating cell by the wire *z ;* and the other rod *m*, with the zinc, by the wire *x ; then*, and not *till* then, (§ 60) hang the moulds on the rod *m.*

49. By an action already illustrated,

* Vide Jacobi's Galvano-Plastic.

† Vide Proceedings of the Electrical Society, April 1840, p. 203.

Fig. 3.



(§ 13.) the copper from the solution is transferred to the mould; and the copper sheet is dissolved, being converted with the sulphuric acid into sulphate of copper; thus keeping up the strength of the solution. The time is somewhat longer by this method: two days will produce a medal of very good substance, firm and *pliable*.

50. In speaking of the *time* required for these experiments, it must be borne in mind that this depends much on the *temperature*. If the solutions are kept boiling, a medal may be made in a few hours. A single-cell apparatus can be readily treated thus: contrivances may easily be devised for applying the heat from a furnace or a spirit lamp; and water is more likely to be needed to supply waste by evaporation, than crystals to supply exhaustation by deposition. In severe weather, the action of the battery almost ceases. During the severe winter of 1840–41, from November to March, my batteries were placed within a few yards of the fire. But for this, I could not have carried on the operations with success.

51. The advantages derived from the introduction of a decomposition cell are not limited to the production of single copies. Two or more may be made without any further consumption of material in the battery. If, for instance, two jelly-pots be placed side by side for decomposition cells, and the plate of copper, (§ 48.) be placed in one, and the mould (§ 48.) in the other: then, if the two cells be connected by means of a bent *copper wire*, dipping into the liquid of each, a circuit will be completed for the passage of the voltaic current. In *one* cell, the copper plate will be dissolved as before; (§ 49.) and copper will be deposited on one end of the bent wire: in the *other* cell, the end of that wire will be dissolved, and copper will be deposited on the mould. If the bent wire is removed and a *mould* is fixed (§ 27.) on one end of it to receive the copper released in the *first* cell,—and a plate of copper* on the other end, to furnish a supply in the *second* cell, the *one* action of the battery will produce *two* medals.

52. This mode of proceeding is not confined to taking merely *two* copies at a time; it may be extended much further by using more cells. Experience has taught me that *six* is the most convenient number. The cells are to be connected, each to each, by bent wires, having a mould on one end and a piece of *copper* on the other. In proportion to the number of cells used, the *strength* of the solution (§ 48.) in them must be reduced by adding water, and its *conductibility* increased by adding acid. It is desirable to place the moulds and sheets of copper as near together as possible, taking care that they do not *touch*. A single pair of copper and zinc in the battery or generating cell (§ 46.) will thus produce a series of *six* medals in three days, if the temperature is not much below sixty.

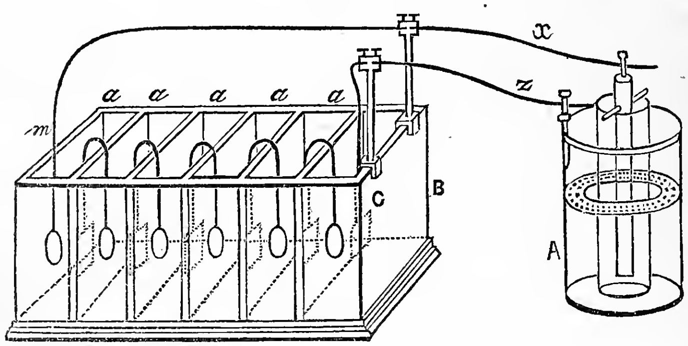
53. Those who possess the earthenware troughs belonging to the Wollaston battery will find the cells, on account of their shape, very convenient for this purpose. These troughs commonly contain twelve cells: I have been in the habit of connecting six with one battery, and six with another; and producing, by the use of one trough, two dozen electrotype medals per

* Soldering is not necessary for this purpose; let a hole be punched in the copper, and the wire be passed through and twisted. It is then as well to varnish the wire, (§ 26.) to protect it. Wires may be united by binding screws, cleft sticks, or twisting.

week. The *shape* of these cells permits the moulds and copper plates to be placed face to face, which, with other precautions, ensures an *even* deposit;—and near to each other, which shortens the length of liquid to be passed through, and thus facilitates the operation The metal obtained by thus placing the moulds in series is of the best description. Troughs, for this purpose, may be made in well-varnished wood, of various sizes, and be divided into six cells, by means of plate glass or glazed porcelain partitions.

54. The advantage of this mode, in point of economy, will be manifest, when it is remembered that for every *ounce* of copper released from the solution in the generating cell, an *ounce* will be deposited on *each* mould (page 24); and about an *ounce* of zinc will be consumed in effecting this. Whether, therefore, one, (§ 48.) or six, (§ 52, 53.) or even twenty, moulds be placed in series, the *same quantity* of *zinc* will be required. Hence an ounce of zinc may be made to furnish electricity enough to produce, according to the will of the experimenter, one, or six, or more medals, *each* weighing an ounce.

Fig. 4.



Battery Apparatus Extended.—Fig. 4 is an engraving of Daniell's battery, thus connected with a series of six cells, in each of which is a mould. *A*, the battery; *B*, the trough; *z*, wire connecting copper plate *C* with the negative (§ 4.) plate of the battery; *x*, wire connecting mould *m* with the zinc of battery; *a*, *a*, *a*, *a*, *a*, five bent wires, each having a mould at one end and a piece of copper at the other. (§ 52.) A little management is requisite in charging this, in order to preserve the bright surface (§ 60.) of the medals produced.—Charge the battery as elsewhere directed; (§ 19, 46.) connect the copper-plate *C* with the battery;—place a *wire* with its extreme ends dipping in the *extreme* cells of the trough; then, having previously connected the zinc and mould with the wire *x*, place the zinc in the porous cell and the mould in its place at *m*; in about two minutes, it will be covered with copper; after this, there is no fear of chemical (§ 60.) action; then remove the end of the copper wire from cell containing *m*, and place it in the next cell;—complete the circuit with the bent wire *a*, having a mould at one end, and a sheet of copper at the other; after waiting two minutes for a deposit of copper, remove the end of the wire one cell further forward; and so continue till six moulds are placed in.

55. I have hitherto spoken of the battery in very general terms: it has been described (§ 46.) as consisting of a piece of amalgamated zinc, and one of copper, the former placed within a plaster cell, and excited with acidulated water, the latter outside the plaster cell in a vessel, containing a strong acid solution of sulphate of copper. A more minute description is here requisite. Although the maximum of electricity results from the exposure of equal surfaces of zinc and copper, yet, for practical purposes, this rule needs not to be rigidly regarded; the common practice is to employ a greater surface of copper than of zinc;—and this rather for convenience's sake: the mean between two surfaces of different size gives the size of a pair of equal plates with power to generate the same amount of electricity, other things remaining unaltered.

56. *Daniell's Batteries.*—Small Daniell's batteries (§ 19, 46.) have been con-

structed, which are very convenient for this purpose. They consist of a copper vessel, to contain the blue solution, and to form itself the negative plate; and a zinc rod, within a porous tube. These are fitted up with a perforated shell for containing a supply of crystals, and binding screws to form the necessary connexions.

57. I have been in the habit of rendering the Electrotype art available in the production of the very apparatus which is destined to be employed in the art; and have produced a compact, neat, and very simple *battery*, by the same process by which the battery thus formed will produce copies of medals. I take a large jelly-pot, and placing within it some wax, stand it by the fire, till the wax is melted, and the vessel thoroughly heated; then turn it about, so that the wax shall spread over every part of the interior: and having done this, pour away the superfluous wax. When cold, I rub plumbago, in the manner formerly described, (§ 34.) over the wax adhering to the *sides*. This vessel is then filled with a saturated acid solution of sulphate of copper, and in it is placed a porous tube; the tube is filled with acid water; a piece of amalgamated zinc is placed in the tube; the wire, attached to it, is bent over, and made to press upon the surface of the plumbago. In two or three hours, the whole of the interior where the plumbago is, will be covered with metallic copper. The vessel will now form one of the best and simplest generating or battery cells that can be constructed: this deposition of copper forms the copper-plate (§ 3.) of the voltaic pair. The plaster diaphragm, (§ 44.) and the solutions will complete the apparatus. Or the *whole* of the interior surface might be covered with plumbago; and when, after having been used for a week or two, the deposited copper should become thick enough, it might be drawn out, or the earthenware cell might be broken from it, and thus a complete cell of a Daniell's battery (§ 46.) might be obtained without a seam or join. To connect a wire with this coating, it is only necessary to brighten the end, and bend it so that it shall press closely. This method of forming a generating cell offers very great facility towards the application of Electrotype on a large scale. By the extension of this principle, apparatus of any size can be economically constructed; a water-butt, for instance, could be converted into a battery cell, if the object to be copied required a large quantity of electricity.*

58. A very neat decomposition cell has been constructed, consisting of a box a foot deep, a foot long, and two or three inches wide: the size varies according to circumstances. Two parallel wires are secured along the top; one may be connected with the zinc, and the other with the copper of the battery. On the former are hung the moulds,† by merely bending the wires attached to them (§ 27) into a hook: and on the latter is hung a sheet of copper. These wires may be placed nearer to each other as circumstances require. By this means several medals may be made at the same time.‡ This arrangement is most commonly adopted: it does not of course economize the zinc, as described in a former place. (§ 54.) One ounce of zinc produces six or more medals, not weighing *each*, but *all together*, an ounce.—The engraving (§ 48.) represents one of these wooden troughs, connected with a Daniell's battery, and Fig. 5, one connected with a Smee's battery. The latter consists of *platinized* silver and *amalgamated* zinc. There is no diaphragm required, and the one exciting liquid is acid and water. This battery has of late been very much used. From the description already given of batteries the principle of action will be readily understood. The silver plate *S* of the battery is connected with the copper in the decomposition trough;—the zinc *Z* is connected with the moulds. Those who employ this battery must attend to Mr. Smee's caution against dropping by accident any solution or crystals of sulphate of copper into it; for the copper would at once be deposited on the platinized plate, and alter the nature of the battery.

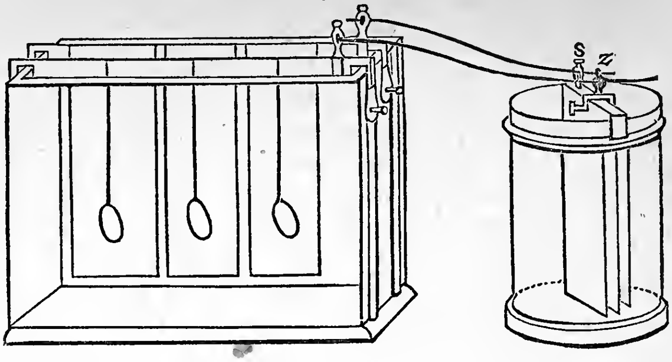
59. Enough has now been said to familiarize the reader with the nature and mode of employing these apparatuses. He will use his own judgment as to the particular form he may select; the object in view has

* For another and very useful generating cell, *vide* § 76.

† These troughs are admirably adapted for obtaining copies of large plaster casts; such for instance as the Cartoons, the Elgin Marbles, &c.

‡ Cells of this *form* are now made in earthenware at Doulton's Lambeth Pottery.

Fig. 5.



been so to simplify the "modus operandi," that those who attempt this very interesting art may find the way made smoother before them.

60. *Management of the Moulds.*—There are some circumstances connected with the management of the moulds, to which it will be well here to advert. The copper solution will act *chemically* on the fusible metal, if the mould is placed in it before the battery is in action, and will produce on its surface a dirty dark deposite. To guard against this, it is necessary that everything should be arranged before the mould is placed in the situation allotted to it. (§ 48.) The circuit should be completed by immersing the mould *last.* (§ 46, 48, 54.) With this precaution the immersion of the mould will be followed by an *instant* deposit of copper on its *whole* surface; after which there is no fear of the oxide. A circumstance no less strange than true in these experiments is, that the surface of a fusible mould thus managed is never *wetted* by the liquid in which it is placed; in fact it never comes into *actual contact* with the liquid; its immersion in the liquid and its receiving a coating of copper are *simultaneous;* the one is the *instantaneous* cause of the other. When the copy is removed, the mould is as *bright* and as *dry* as when first made.

61. The deposition of the copper on the plumbagoed surface (§ 34.) of the wax moulds, is not thus *instantaneous.* The film of conducting substance with which they are coated, is so thin that it will not convey sufficient electricity to produce this effect over the whole surface *immediately* on immersion. The deposition of copper is *gradual:* it commences in the neighbourhood of the wire attached to them, (§ 34.) and spreads gradually over the remaining portion. These moulds *do* become *wetted*, and the medals obtained from them come off with dirty surfaces; the medals also bring with them the whole or part of the plumbago, and hence the moulds if not damaged, require a fresh coat of this before they are used again. (§ 35.) These dirty specimens may be very readily cleaned if required; the mode will be described in the sequel. (§ 68.) The production of dirty medals is the least evil arising from the use of plumbago moulds; here is one of far greater importance—one which requires some attention to escape. As the deposition of copper, which is *gradually* diffused over the whole surface, *commences* at one point contiguous to the connecting wire, it follows that the power of the battery at the first is concentrated in a *small* space. The consequence of this will be, that unless means be taken to avert it, hydrogen will be evolved with the copper at *first* (§ 63.) decreasing in quantity till enough of the mould is covered with a film of copper to increase the size of the surface to the requisite standard for releasing *copper alone;* after this all things go on well; but it is invariably found that the portion near the wire, from the irregularity of the primitive deposit, is *rotten* or very brittle. To prevent this, I always *begin* by placing a *wire* in lieu of a *plate*, opposite the plumbagoed mould, in the decomposition cell; this reduces the power of the battery or the quantity of electricity passing:—as the copper deposits, I immerse the wire to a greater depth, and when the mould is partially covered with copper, I remove the *wire*, place in the copper *plate*, and leave the experiment with the assurance of a successful result.

Guiding Wires.—Since the eighth edition appeared, an ingenious plan has been

suggested to me of facilitating the deposit over plumbagoed surfaces, by the use of fine wires to which I have given the name of 'guiding wires.' One or more thin wires are twisted round the main wire, (§ 34) and their ends are allowed to rest against different parts of the mould, especially in the recesses of deep relief; and thus the copper is led to deposit over all parts of the surface in a short time. When this is effected, the 'guiding wires' are carefully removed.—Moulds furnished with these appendages may be put into the decomposition cell without the precaution of using a *wire* first instead of a *plate*, as above suggested. It will occasionally occur in wax moulds, and sometimes in fusible metal moulds of very elaborately executed medals, that bubbles of air remain in some of the complicated interstices; these must be removed, or the result will be infallibly disfigured. They are removed by lightly brushing the surface of the mould with a feather, *immediately* after it is immersed in the liquid.*

62. *Management of the battery apparatus.*—The Electrotypist, who expects to find *all* his experiments going on favorably, will be often grievously disappointed: with the best intentions and the most careful arrangements he may *sometimes* fail. For, after having observed *all* the directions hitherto given, his battery may have *too little* work to do, or *too much*, and this can only be determined by experience, and by attention to the principles laid down in this book. The former will produce the *dark powder*, elsewhere mentioned (§ 47.) the latter a hard *red brittle* deposit, or a heap of crystals. The terms *too much* and *too little*, are here used in a very general sense, and will be better understood by describing the *causes*, the *results*, and the *mode of rectifying* these irregularities.

63. If the battery is *too large*, or the copper plate in the decomposition cell (§ 48.) is *too large;* or if the mould is *too small*, (§ 61.) *hydrogen* as well as *copper* will be released, and the deposit will be the *dark powder;* the same will occur if the solution in the decomposition cell contains too *much* acid or too *little* sulphate of copper. To rectify this, the battery may be made *smaller* by pouring out some of the solution, and so exciting less of its surface; or a smaller copper plate may be used in the decomposition cell; or crystals of sulphate of copper may be thrown into the liquid contained therein; or the copper plate and mould may be removed *far* apart; or a *fine* wire may be interposed between the mould and the wire connecting it with the battery. Each or all of these alterations may be made according as circumstances or convenience shall dictate: a few days' experience will be better than pages of instruction.

64. If the battery is *too small*, or the copper plate in the decomposition cell *too small;* or if the mould is too *large*, or if the decomposition cell contains too *little* acid or too *much* sulphate of copper, or if the weather be too *cold*, the copper will be deposited *very* slowly, and will present a dull red exterior, and be of a very brittle texture; or will be thrown down in a crystalline form. The alterations necessary to rectify this defect will readily suggest themselves.

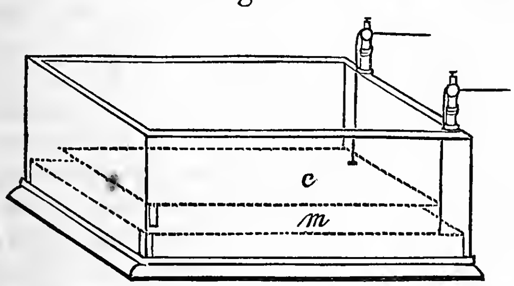
65. The medium between these two conditions fortunately has a very wide range, so that the chances of avoiding the two extremes are greatly in favor of the experimenter. The lines of demarcation within which the proper deposit is obtained, are, as may be imagined, not precisely defined. And hence the deposited metal possesses various gradations of character, according to the circumstances under which it is obtained. When all things are going on well, if the mould be lifted out* of the solution, it will present a *brilliant*, *light*, *copper-colored* surface; this characteristic can never be mistaken after it is once seen. The deposited metal will present various thicknesses, according to the relative position of the mould and the plate of copper; if they are face to face, and parallel, the thickness will be uniform or nearly so; generally speaking, the copper on the lower part of the mould is thicker than that on the higher; this occurs from the specific gravity of the sulphuric acid, used to render the liquid conductible, determining it

* If it should seem that any part of the mould is not sufficiently coated with plumbago, it must be removed from the solution, washed with water, dried with blotting paper, and again rubbed with plumbago.

* The mould may be removed at any time with impunity.

in a measure toward the bottom of the cell, rendering the lower part of the liquid more conductible than the upper. To cause a more uniform distribution, it is better to stir the liquid occasionally. Some moulds are better placed at the bottom of a vessel with the copper above them. When this is done, a muslin strainer should be interposed, because all heavy deposits fall on the mould and disfigure the results. This arrangement will be understood by a glance at Fig. 6., consisting of a flat trough to be connected with a Daniell's or other battery; *m* is the mould, placed beneath the plate of copper, *c*. If the mould in this, or in any other cases, is wax, &c., arrangements must be made to prevent its swimming. This is readily done by securing a

Fig. 6.



piece of wood to the trough, and fastening the wire of the mould to this; or by warming a piece of lead, and pressing it into the back. I have now given directions applicable perhaps to all cases: a right comprehension of these and of the principles on which they are based (§ 63.) will enable the veriest novice to labor with little or no fear of failure.

66. The medals are removed from the *fusible* moulds by gradually raising the edges with a pointed instrument, a brad-awl, for instance, and then using it lever fashion to raise the medal out of the mould. Care must be exercised in this, for the contact between the two is so close, that the force occasionally required may cut the medallion. The separation from the *wax moulds* requires no force, they are laid downwards on a table, and after pressing the slight overlapping edge of copper with the brad-awl in different parts of the circumference, the two may be pulled apart.

IV.—Bronzing.

67. If proper precautions (§ 60.) are taken, the medals from the fusible moulds will *generally* present a bright *copper* surface; occasionally, however, they will present a very brilliant surface, greatly resembling *silver*. When this is the case they are ready, without further trouble, for the cabinet. The silvery tint is obtained only on *first* specimens; it would seem that the surface of the *new made* mould is covered with a metallic film, which attaches itself *firmly* to the surface of the deposited copper. It is so firmly attached, that it may be polished with a leather or plate brush, without sensibly affecting it. If specimens of this description are exposed to the air, they will occasionally require the application of the plate-brush to restore their primitive brilliancy.

68. *Chemical Bronze.*—There are many modes of bronzing employed in the arts; the intent of each is, to bring out the workmanship of the object. The selection is entirely a matter of taste. To prevent too great a sameness of appearance in a cabinet, it is perhaps better not to confine oneself to a solitary method.—A *chemical* bronze may be made by boiling two ounces of carbonate of ammonia with one ounce of acetate of copper, in half a pint of vinegar, till the vinegar is nearly evaporated. Into this pour a solution consisting of sixty-two grains of muriate of ammonia, and fifteen grains and a half of oxalic acid in half a pint of vinegar. Replace the vessel on the fire till the contents boil; when cold, strain through filtering paper; preserve the liquor for use. The remaining sediment may be again treated with another half pint of the solution. This preparation must only be applied to medals perfectly *bright* and *clean*.

69 Dirty specimens (§ 61.) may be polished by an article used in domestic economy, consisting of rotten-stone, soft soap, and water; the medal is to be well rubbed with a hard brush dipped in this. Care must be taken not to scratch the medal. It must afterwards be washed in water and placed to dry; when dry, the application of the leather and plate brush will produce the required polish. Medals may also be cleaned by dipping them for a few seconds in nitric acid, either concentrated or diluted; wax and grease may be removed by boiling in pearl-ash and water, or by pouring the boiling ley on the medals.

70. In applying the bronze, first warm the medal, then dip a camel's hair pencil into the liquor, (§ 68.) and brush the surface for *half a minute; immediately* after pour *boiling* water over it; *directly* the medal is *dry*, rub its surface lightly with soft cotton, *very* slightly moistened in linseed oil; gentle friction with a piece of dry cotton will finish the operation. The color produced by this means is red; its tint varies according to circumstances. Medals bronzed thus must be examined occasionally, before they are consigned to the cabinet; for if perchance the vinegar has not been *perfectly* washed away, they will be disfigured by the formation of a green powder,—the acetate of copper. Should this occur, it may be removed by means of the moist and dry cotton.

71. *Black Lead Bronze.*—A very beautiful bronze is obtained by the simple application of plumbago: it is obtained in a few minutes, and with very little trouble. The tint obtained, seems very much to depend on the condition of the *surface* of the *original medal*, copies of some medals 'take' the black lead better than those of others. To produce the tint in the greatest perfection, the operation should be performed *immediately* after the medal is separated from the mould. (§ 66.) *Bright* specimens from *fusible* moulds are best, but all others may be thus treated; those taken from wax should be cleaned with pearl ash or soda. (§ 69.)

72. The bronze is obtained by brushing the surface of the medal with plumbago; then placing it on a clear fire, till it is made too hot to be touched, and applying a plate-brush, so soon as it ceases to be hot enough to burn the brush. A few strokes of the brush will produce a dark brown polish, approaching black, but entirely distinct from the well-known appearance of black lead. If the same operation is performed on a medal that has been kept some days, or upon one that has been polished, (§ 68.) a different, but very brilliant tint is produced. The color is between red and brown. The richness of color thus produced, is by many preferred to the true dark brown.

73. *Carbonate of Iron Bronze.*—Very beautiful tints are produced by using the substance commonly known as plate powder or rouge: after moistening it with water it is applied and treated precisely in the same manner as the plumbago. Some care and practice are required in its use, lest it should *stain* instead of *bronze* the medal. I have just received from the publishers of this book a specimen of bronze superior to any I have elsewhere met with. It leaves nothing to be desired. Should the experiment fail, the several bronzes may, in many cases, be removed, and the attempt can be repeated.

74. Mounting the Medals.—I have adopted a method of mounting the medals obtained from the *fusible* mould, (§ 26, 60.) which gives a finish to their appearance. I obtain pale green cards, the size of visiting cards, and cut some of these into single squares, the *width* of the card being the side of the square; others into smaller squares, *half the length* of the card forming the side of the square. A pencil circle is drawn the size of the medal; and two *ink* circles in order to 'throw' the medal 'forward.' The part within the pencil circle is cut out; and waste cards are cut to fit the extra edge of the medal. The two cards being fixed together with very strong gum water, the medal is placed in, and secured by another card gummed on at the back. The obverse and reverse are then gummed back to back, and thus the appearance of a perfect and solid medal is produced, equal in point of workmanship and beauty to the original. To hold the card together until the gum dries, I use cleft sticks. The medals obtained from wax moulds, having no addition to the edges, are not well fitted to be mounted thus; they may simply have any roughness removed from their edges with a sharp file, and be placed in the cabinet without being fitted with cards.

V. Concluding Observations.

75. In the preceding pages, I have dwelt on the copying of medals and plaster medallions alone, and have given such hints on the several stages of the process as have occurred to me during a long course of experiment. Much more could be added, but not without extending this treatise beyond the limits to which I have determined to confine myself. Enough has been said to render the subject familiar, and to enable those who are successful in copying the small objects here treated of, to carry

their experiments to any extent. Busts, statues, vases, may, by proper application of the principles laid down, be as readily coated with copper as the small wax moulds. (§ 28.) Yea—almost anything, to which a coating of plumbago can be given, may serve as a mould on which to deposit the metal. With no credit to my discernment, I might devise a thousand instances in which this art will be available in the common concerns of life; but rather leave the merit to those who shall actually introduce it into these several spheres. It may be found available in protecting from the effects of weather the busts and statues which are introduced in ornamental gardening; and which are often, for the sake of economy, made of plaster of Paris. They may be saturated as described elsewhere (§ 35.); covered with plumbago (§ 34.) and placed within a large vessel whose sides are covered with copper, (§ 57.) and then by means which now must be familiar to the reader, a deposition of copper may be formed on them; this can be bronzed by the simple application of the black lead brush; and thus a sightly and permanent exterior will be produced.—By the same means small and valuable wax figures may be preserved; the surfaces of these are of themselves very liable to crack, and fall off in chips. A *thin* covering of copper, without in the least degree affecting the fineness of the workmanship will preserve it.

ELECTRO-LACE.—Among the recent productions of our art is electro-lace, originally intended as a substitute for gauze in Prof. Grove's modification of Smee's battery,* but adapted to the formation of a thousand articles of fancy work. A piece of lace is stretched on a frame, and well rubbed with warm wax; it is then held to the fire to effect its saturation with wax, and is placed afterwards, and while hot, between two pieces of blotting paper, in order to remove the wax from the pattern. It is then plumbagoed and treated as an ordinary mould. A few hours' action will so deposit metal on it as to present the character of a perfect conversion into copper. This may be plated or gilded, (§ 126.) and worked into every shape.

* Vide Proceedings Electrical Society, Part II. p. 117.

76. CONSTANT ACID BATTERY.—Since the *first edition* of this work, I have been employing, with slight modification, an ordinary *acid* battery, and find it admirably adapted to the purpose of Electrotype, when time can be allowed for its action. Other circumstances being the same, it requires nearly twice the time of a sulphate battery: but this is in a degree compensated by the fineness of the deposit obtained, and the trifling expense attending its use. The interior of a jar is coated with copper, (§ 57.) and the action is continued until the solution employed for this purpose is exhausted. By this means the surface of the copper obtained presents an infinite number of small points, which very readily part with the hydrogen. The principle is precisely that developed by Mr. Smee, and brought to practice in his platinized battery.—This arrangement may be adopted without the use of diaphragms; but it is, on the whole, better to employ them; because the solution of sulphate of zinc is thus kept away from the copper plate. Amalgamated zinc is employed.

77. MANIPULATION WITHOUT ACID OR MERCURY.—In the several kinds of apparatus described in the course of this treatise, the reader will not have failed to notice that the use of *acid* is recommended, and also the employment of *amalgamated* zinc. The uninitiated in the science of Voltaism might even be led to think that acid is a *sine qua non* in the process. This however is not the case; it is very valuable for *increasing the conducting power* of the copper solutions, and for *dissolving the oxide of zinc*, as it forms on the zinc plate, and no further.

Its absence will therefore *diminish* the conducting power of the copper solution; and leave the oxide of zinc *undissolved*. The former is not so serious an inconvenience as might be at first imagined; for it will be remembered (§ 63.) that one of the causes of the brittle deposit is the readiness with which hydrogen is liberated from the copper solution, on account of the presence of *too much* acid, or *too large* a piece of zinc. Take away the acid, and one cause of such failure is removed. The oxide of zinc remaining undissolved and on the surface of the plates, would be an effectual check to the process; so that when the acid is removed its place must be sup-

plied with something which will act upon this oxide; several neutral salts are applicable, as, for instance, muriate of ammonia, or even common table-salt. Any of the arrangements of battery elsewhere described may thus be excited without the *use of acid.*

78. A single cell apparatus may consist of a wooden box, well varnished in the interior, and divided into two unequal cells by a partition of porous wood. The wood is prepared as described above. (§ 17.) The larger cell is filled with a saturated solution of sulphate of copper, the smaller with a half-saturated solution of muriate of ammonia, or one of common salt. In the former is a shelf for containing a supply of crystals. Plates of either pure zinc, or of the zinc of commerce unamalgamated, may be employed. The action of this, or of any other form of apparatus, excited with salt, and constructed with unamalgamated zinc, is not so energetic as in the forms elsewhere (§ 46, &c.) described, where acid is used; but this is no vital objection; for it must be borne in mind that "in Electrotype Manipulation the failures in nine cases out of ten result from the power of the battery being too *strong*, and not from its being too *weak*."*

79. Recent experiments have furnished me with some information relative to the mode of managing wax moulds to which a portion of the plaster may have adhered. I have said (§ 31.) that they may generally be drawn apart: this is not always the case, for if the water with which the plaster is soaked be too cool, or if the cast be not perfectly saturated, the wax will adhere; and even with every care, this will at times be found to occur, on account of imperfections in the structure of the cast. Unless the latter has been cast from good plaster very well mixed and stirred, it will be of a rotten texture, and will readily break off in fragments after it has once been wetted; and these fragments will adhere to the mould. Having thus destroyed the cast, it is an object of some importance to preserve the mould by removing the fragments without affecting the wax surface. This is readily done by gently touching each spot of plaster with a wire dipped in sulphuric acid; and then leaving the cast exposed to the air for ten or twelve hours. The acid will gradually absorb moisture from the atmosphere, and their mutual action will so disintegrate the plaster, that it may be entirely washed away with a camel's hair brush and cold water. This simple process has been the means of effectually restoring to me very many moulds, which otherwise would have been doomed to the same fate as the casts from which they had abstracted plaster.

80. In addition to what has been elsewhere (§ 47, 63.) said, on the subject of the brittle deposit, I would press the matter again on the reader's attention, by giving a few general observations on the theory of the deposits;—"It was thought that the rotten deposit—a characteristic with which all those who are but just initiated into the art are familiar—results from the presence of the sulphate of zinc among the sulphate of copper. . . . The real cause depends on the relation subsisting between the generating power, dependent on the action between the zinc and the acid, and the strength of the solution of the sulphate of copper, on which this power is exercised. If the latter is well saturated, the copper will be released pure and firm; if it is almost exhausted, the hydrogen gas will be released with the copper, and the deposit will be a dull *powder*. In the wide range between these two states is found the brittle deposit: it appears under many varieties of forms, according as the solution is nearer to a state of saturation or to one of exhaustion on the one hand; or according to the energy or weakness of the affinity between the zinc, and its exciting solution the other. This latter condition exists in a modified form, when a *large* piece of zinc is used with a *small* object to be copied. The deposit is very *hard* but not tenacious. It may be easily broken. In copying seals and such like small objects, little pieces of zinc an inch square are quite large enough."*

81. Engraved copper plates may be readily multiplied by electrotype. The battery must be in proportion to the size of the plate, and the plate must be used in lieu of the moulds. (§ 58.) Sometimes the copper deposit will adhere so strongly

* Proceedings Electrical Society, part I. p. 31.

* Vide Proceedings, Electrical Society, Part I. p. 28.

as to resist all attempts to remove it. This may be prevented by a very easy process. Before the plate is used, heat it and rub bees' wax over the surface; continue the heat and by the application of soft cotton, rub it perfectly clean from the wax; or the plate may be rubbed with black-lead in lieu of wax. In either case it may then be used without fear of adhesion. The deposit obtained on it is to be removed, and used as a mould, from which many copies may be taken, equal, in all points, to the original.

82. Much has been said on the subject of multiplying valuable plates by electrotype; and, without doubt, it will be employed in some instances. As when a periodical of *extensive* circulation is illustrated with prints from copper plates, one engraved plate will be worn out, before the whole impression is obtained. Here the art of electrotype offers a very ready aid. But when a work of a higher order in the arts is published,—it is not likely that the publishers, after incurring the great expense which they will of necessity incur, should so multiply the plates, and by their own act so glut the market, as to depreciate the value of the proofs and prints, and certainly damp any hope of a remunerating return for their outlay.

83. Electro-tint.—Another form of deposit has been termed electro-tint. It consists in painting on white metal with etching ground or varnish:—the several shades are obtained by the relative thickness of the layers of varnish: the whole is then plumbagoed; and the deposit obtained on it is used as a plate to furnish prints. Prof. Von Kobell, after obtaining a plate, examines a proof: and if too faint, he makes a mould of the plate; and having obtained a deposite, which will be similar to the original painted plate, he puts varnish on the parts which gave impressions too pale, and obtains a second deposit on this, which when removed will give prints of a better character.

84. Though copper is the only metal to which allusion has been hitherto made; yet, with proper care, *all* metals may be obtained from their several solutions. Plating, gilding, and etching in its several varieties are fully treated in Part II..—this art is even applicable to the copying a plate obtained by the Daguerreotype process. From the rapid strides already made, we cannot but think it will be at some future day *successfully* applied to this difficult but interesting subject;* and assuredly, when the day shall come that the shade of a dear friend, traced by a sunbeam on the silver surface, is durably transferred to the electrotype plate, this art will have attained a height indeed.†

* Since the words in the text were written we have seen the success attending Mr. Grove's experiments; by this art he etches a plate, and by this art copies the etching.

† I have now before me some very fine specimens of prints from etchings of Daguerreotype plates, by Dr. Berres of Vienna.

Patent Electro-Cloth.—Messrs. Elkington are coating cloth with copper for various purposes in the arts, as packing, roofing, &c. Instead of adopting the usual method of covering the surface with plumbago to impart conductibility, they paste the cloth on copper plates. The copper plates being made the cathode in a solution of sulphate of copper, the interstitial action of the metal avails to induce a uniform deposit. Plating and gilding is introduced if required: the metallic cloth, when removed from the copper plates, is passed between rollers. The paste employed for this purpose is of a peculiar kind, the result only of actual experiment. Sometimes the single-cell process is adopted. The linen is then pasted on one side of an iron plate, the other side of which has been previously embedded in cement. The whole is then placed in the solution of sulphate of copper.

GOSSIP.

— We understand that certain parties have taken our remarks—in the last number of the Journal—on the Hillotype, as particularly aimed at them. We will say to these gentlemen that they were not dictated by any hostile feeling on our part to them or any others. We have no such feeling. In penning the article we gave the language of our informants as near as it was possible for us to do so, and made our comments on the facts in accordance with our views as to the policy indicated. We mentioned no names, a course which the publicity of the rumors, as well as the sources from which they emanated gave us a right to do—from a feeling of respect to those parties.

On a subject in which the public mind is so much engrossed, it becomes the duty of a public Journalist to watch with jealous eye its progress, and for the interests of the mass of those whom it is intended to benefit, detect, and if possible, prevent any disposition of the invention, discovery, or improvement derogatory to that interest. These are our reasons for all we write concerning the Hillotype—If it came to our knowledge that our very best friend was endeavoring to shake Mr. Hill in his most honorable and liberal determination to act independently of, and untrammelled by any one, as well as in the generous way indicated by Prof. Morse's letter, we should not hesitate a moment in censuring him. Our first duty is to the whole community of Daguerreotypists throughout the world, and whatever tends, in any way, to affect their interests adversely, we shall fearlessly censure—no matter from what source it proceeds—although it may conflict with our personal feelings of friendship.

It is also our duty to Mr. Hill to mention whatever rumors are current that cast a shadow of doubt upon his declared intentions. There are those well calculated and disposed to create mischief between Mr. Hill and his cotemporaries, and who seek every opportunity of giving currency to reports derogatory to his discovery. It is our duty, if possible, to deprive them of their sting. There are others who, honestly, do not believe in the discovery, and although their disbelief will not and cannot affect the result, we should endeavor to remove every stumbling block to their credulity.

Now, we think we have explained this matter sufficiently to remove any bitterness of feeling from a reasonable mind. We can adduce sufficient evidence of our entire disinterestedness in the whole matter, as well as our friendship towards Mr. Hill, to fear the frowns or misrepresentations of those who choose to array themselves in hostility against us, for the free expression of our views, or the statement of alledged facts that come to our ears. We are perfectly aware that there are parties in New York city who have rendered themselves liable to us for an action at law for damages, by the course they have taken to prevent the circulation of our Journal—but we will let that pass—their futile efforts are worthy of contempt alone, and we only mention it here to show that we are perfectly well "*posted up*" in all matters concerning our interests. We have every desire to be on friendly terms with all connected with the Photographic art, but if we cannot be so except by the sacrifice of truth, justice, and independence, we must make head against self-constituted and causeless enmity as we best can. We can sincerely say that we entertain not the slightest enmity towards a single individual in any way connected with the Daguerrean art, either as operators or dealers, and there is not one to whom we would not render strict justice.

We have said much more on this subject than we intended when we began, but our feelings have carried us on so far that we must apologize to our readers for permitting our private affairs to occupy so much of their time. We hope we shall never be obliged thus to allude to them again.

— The Daguerrean Journal.—The number of May 15th of this periodical commences the second volume, and it gives us pleasure to say that Mr. Humphrey's promises of improvement are fully carried out. He has associated with him, editorially, Mr. L. L. Hill, who will add greatly to its usefulness. We shall always be pleased to see it lying side by side with the *Photographic Art-Journal* on the Daguerreotypists table. We must take this occasion to say that our cotemporaries are entirely in the wrong in regard to their application of our remarks in the last paragraph of our article on the Hillotype in the May number.

— "Who shall decide when doctors disagree."—This old adage is as applicable to Daguerreotypists as physicians. It will be remembered that we published, in a back number of our journal, the application of white to the interior of the camera box. We find that there are as divers opinions in regard to its utility as to the efficacy of Brandreth's pills, and although we do not "grasp at every *new discovery*, without instituting any investigation as to its real merit, or employing any means of ascertaining its true importance," we consider the evidence of such men as Everard of France, Kilburn of England, Selleck and others of New York, who have tested its merits, as equally reliable with those who may differ from them We find differences of opinion among Daguerreotypists on all subjects connected with the art, even on the most simple. Some operators will use none but a certain brand of plates, while others consider them worthless. Some prefer this kind of sensitive others that. Some adopt one method of cleaning their plates, while others pronounce that method entirely inadequate to the purpose. These various opinions are as often found among our best artists as among the dabsters. Now we consider it the wisest course to present to our readers all the alledged improvements that are published, or handed to us—commenting upon them according to the evidence we have in our possession as to their utility—and leave each operator to adopt, or discard them as he may think proper.

— While we are speaking on the subject of improvements, we will call attention to two new articles invented by a Mr. Kingsley, and for the sale of which Mr. Anthony, 308 Broadway, N. Y , has been appointed sole agent. One is a "plate bender," the other a "plate holder," on which to clean and polish the plate. In using the latter the artist does not require a plate vice. As we intend devoting a chapter, in a future number, to recent improvements in apparatus, we will merely say here that large numbers of the plate benders have been already sold, and proved satisfactory, while every operator who has seen the model of the plate holder has expressed his approval of its construction. The price of the "bender" is but $1,50; and of the "holder" only $3,50 a set, from the ninth to whole size.

— The Messrs. Lewis have just completed a decided improvement in the camera box, in principle similar to one got up two years ago by Mr. Whipple of Boston. We shall speak of this together with other improvements made by them in other articles of apparatus, as well as of an improved camera box constructed by Mr. W. A. Allen of the same city, hereafter.

— We have so many inquiries regarding the time for making the Hillotype process public, that it is impossible for us to answer them all personally. Besides we think it shows a very illiberal spirit on the part of those Daguerreotypists who are not subscribers to the Journal, this pestering us with letters of inquiry on a subject they may find as fully discussed in our columns, as we are able, with the material in our possession. We publish each month all we hear regarding the discovery, so far as it does not do injustice to any party. Those, therefore, who wish information on the subject must subscribe for the Journals devoted to the Art. We must decline answering letters, as it takes up more of our time than we have to spare. We were informed abont the first of May that the discovery was to be made known in three weeks from that date, but that it has not been, must be as well known to Daguerreotypists as ourselves. We shall take the trouble to send a suplementary notice to *all the subscribers* of the Photographic Art-Journal announcing the fact, if Mr. Hill is ready to dispose of his secret before our next issue.

— We have received the following anonymous communication, which we publish for the valuable hint it conveys. There is generally too much neglect in plate cleaning.

MESSRS. EDITORS.—If you deem the following worth an insertion in your Journal, you have it freely.

A Daguerreotype plate is like a field of waving grass, which you wish to cut, that the honey bee may extract the sweets from the juicy stubble. A vigorous arm and a keen blade will alone effect the object. So on the delicate surface of silver, if you would make a picture, cut it away, rapidly, evenly, lightly, and you have the metal with a surface of open pores ready to receive the traces from the faintest sunbeam. Work with a laggard hand, and like the indolent farmer pressing down the stubble with his dull edged scythe, you crowd over the texture of the delicate silver, and fill up with foreign matter its innumerable pores.

THE HILLOTYPE SUPERCEEDED.—We have just learned—too late to give a lengthy notice of the announcement in this number—that M. Niepce of Paris has discovered a process for taking daguerreotypes in the natural colors. Our next issue will contain as full an account of the discovery as we can possibly obtain from France. We head this notice as we do, because we think that the dilatory movements of Mr. Hill have been the principal cause of the event.—An event we have long feared, and which we have endeavored to prevent by exciting a more energetic spirit in bringing the Hillotype forward, but to no effect.

—The present number of the Journal completes the first volume. We shall endeavor to improve the next volume commensurate with the liberal support we have received. A few copies of the first volume will be on sale in about two weeks. Price, $3,00 per copy, beautifully bound. This is the cheapest volume ever published on the Photographic art. It contains as much as any three works published, which would cost their possessors at least twelve dollars. Copies can be sent by express to almost every town in the United States, orders for which may be sent to W. B Smith, 61 Ann street, New York, or H. H. Snelling 308 Broadway.

— Our friend A. H***** of Ill., will please accept our thanks for his valuable communication. It will be published in our July number, having been received too late for the present issue. We have also received a communication from our friend W. S. T., which we shall publish in our next. We are glad to see the spirit at last

stirring in the minds of our operators to induce the liberal dissemination of their knowledge, and we feel confident that their reward will be fully commensurate with their liberality, in the amount of benefit others will derive from their experience.

— It gives us pleasure to state that a movement is now on foot to organize a National Photographic Society. A call, signed by a large number of Daguerreotypists of New York, will be made through the papers, in a few days, for a convention of artists, to be held at Syracuse during the last week of August next. It is thought by those interested in this momement that not less than five hundred from the State of New York alone, will attend the convention, and we have no doubt that the artists of every section of the United States will be properly represented. This movement is the work of one of our most esteemed and energetic Daguerreans, whose name we should be pleased to present to our readers, were it not for a positive prohibition on his part, for the present. Let us earnestly beseach our Daguerrean friends all over the country to meet this appeal of the New Yorkers with a friendly and approving spirit. Let Daguerre, the great discoverer of this beautiful art—and the world—see what a host of worthy artists he has raised up to honor his name. Let none stay away from the assembly who can raise the means to attend. The day of the meeting of the convention will be given in our next.

— Our friends at the south are informed that William S. Tisdale, Esq., has kindly offered to act as our agent in the Southern States. Orders transmitted through him, either for subscriptions to the Journal, or for bound copies of the first volume will be punctually attended to.

— J of Hillsville, Va., we are pleased to inform, will soon read an article in the Journal on the subject of his inquiry. It will be by one of the first practical Daguerreans in the city of New York.

— J. W. P. Mr. Anthony's $500 Premium *is a bona fide* offer, and not intended as "a tall kind of advertising," as you remark, and *will* be paid to the candidate designated by Profs. Morse, Draper and Renwick. We should judge that the Hillotype cannot be taken into consideration in awarding the prize, it having been announced before the premium was offered. That is a question, however, for the committee to decide.

— We have heretofore been unable to comply with the request of many dealers in Daguerreotype stock and of Daguerrean artists to insert their advertisements in the journal for want of space, as we devote our *cover only* to that purpose. We will, however, add four pages more, provided we can get sufficient advertisements to fill them up at the following rates. Our terms are for

1 page	$200,00	per annum.
1 column	100,00	" "
$\frac{1}{2}$ "	50,00	" "
$\frac{1}{4}$ "	25,00	" "

Cards of Daguerrean artists, not exceeding three lines, $3,00.
Do. do. do. six lines, 5,00.

We now issue one thousand copies of the Photographic Art-Journal each month, which makes it a valuable medium for communication with the Daguerrean art. It also circulates among others besides Daguerreotypists.

— Our semi-anual subscribers will please remember that the present number of the Journal closes their term of subscription. We shall be happy to hear from them again before our next issue, as we shall continue to send to those only who renew their subscriptions in advance as usual.